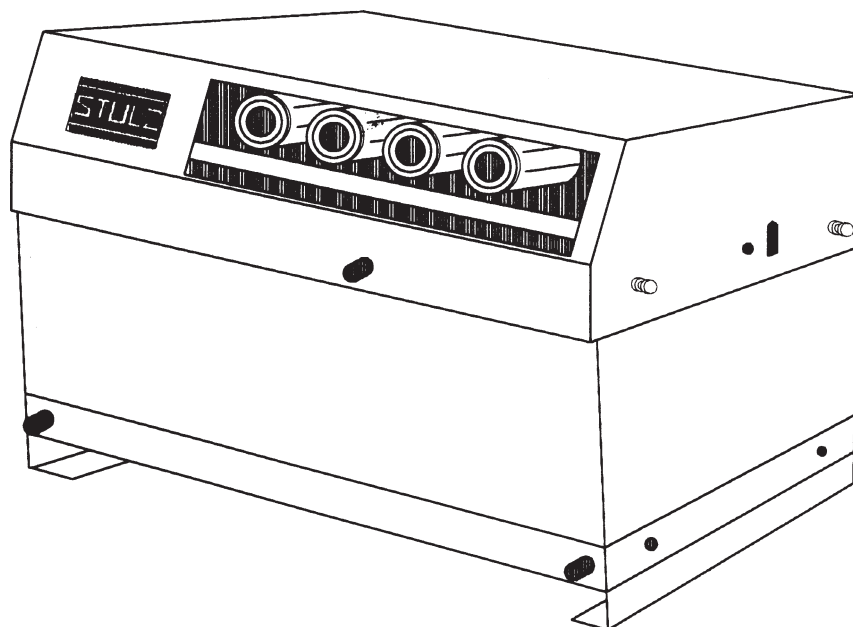




Issue 10.94e

AIR CONDITIONING

ULTRASONIC/BNB



TECHNICAL MANUAL

We reserve the right to make technical changes

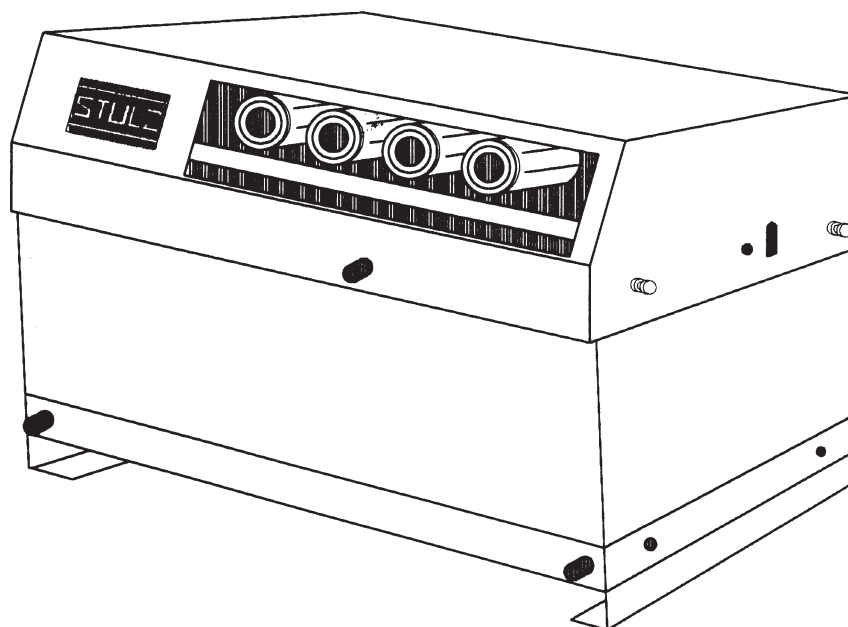
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1. Application areas, method of operation

BNB Model range

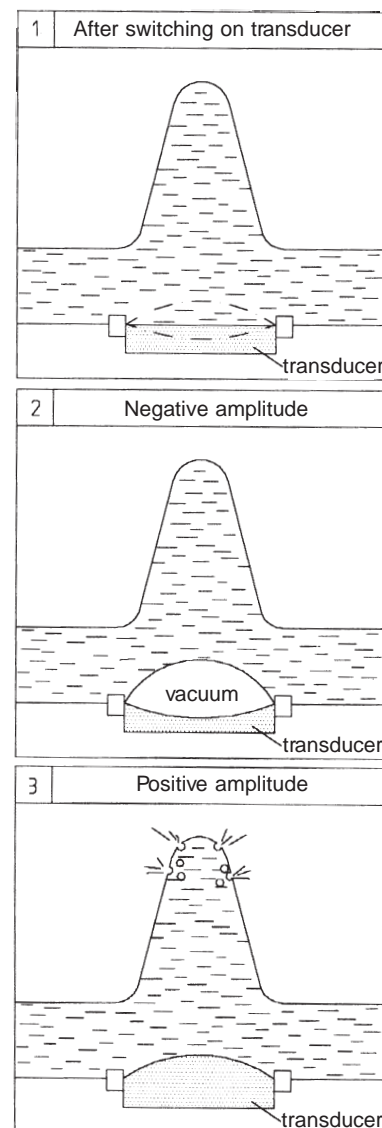
Units of the ultrasonic BNB 1000 to BNB 8000 model range are available for direct room humidifying. The key components of this unit consist of high-quality steel or high-quality plastic. A fan is integrated into chassis which carries the mist generated in the water bath out into the room. This unit is used, for example, for humidifying production rooms, EDP rooms, warehouses, printing plants, museums, restoration workshops, theatres and many other areas, in which optimum humidity is necessary for production, storage or to maintain room air conditions.



Method of operation

The STULZ ULTRASONIC model range of air humidifiers work in accordance with the principle of ultrasonic atomization. A 48 V alternating voltage is rectified on a printed circuit board and converted into a high frequency signal of 1.65 MHz. This signal is transmitted to a transducer installed in a water bath which converts this signal into a high-frequency mechanical vibration. The transducers installed are so-called thickness transducers which change their thickness 1.65 million times per second corresponding to the applied signal of 1.65 MHz.

The surface of the transducer vibrates at such a high speed that the water can no longer keep up due to its mass moment of inertia and a water column builds up above the transducers immediately after the unit is switched on. During the negative amplitude of the transducer, the water cannot follow the rapid movement and an instantaneous vacuum is created. Bubbles occur due to cavitation which are "catapulted" to the edge of the water column in the curve of positive amplitude and collide with each other with a large force. During this process the finest particles of water are atomized at the edge of the water column. Cardan waves are generated due to the focusing of the sound waves right underneath the water surface, in the center of which the smallest water droplets detach and produce a mist which is immediately picked up by the air flow.



2. Technical information on the BNB model range

The BNB ULTRASONIC humidifier works in accordance with the principle of ultrasonic atomization. The mist, which is produced in a water tank with the aid of a transducer, is blown into the room by a built-in fan. The humidifier consists of the atomization modules, the supply module with a solenoid valve, via which the water supply runs, as well as float switch and a housing in which a fan is accommodated. A switchgear cabinet must be located externally which contains the control as well as the power supply of the unit.

Model		BNB 1000	BNB 2000	BNB 3000	BNB 4000	BNB 5000	BNB 8000
Output*	l/h	1.0	2.0	3.0	4.0	5.0 2x2.5	8.0 2x4.0
Number of transducers		2	4	6	8	10	16
Transformer	Primary: Secondary:	110V/208V/230V/400V/460V \pm 15 V 50/60 Hz 12V/24V/36V/42V/48V/52V					
Nominal output	W	100	180	250	340	430	670
Transformer output	VA	160	320	320	500	500	2x500
Weight	kg	7.1	9.3	11.2	14.0	16.1	23.0
Dimensions 1024	A	mm	254	364	474	584	694
Dimensions 990	P	mm	220	330	440	550	660

We reserve the right to make technical changes/*output at: water height of 40 mm, air temperature of 26°C, water temperature of 26°C, voltage 48 V.

Application condition: Temperature 5°C to 40°C, relative humidity below 90%.

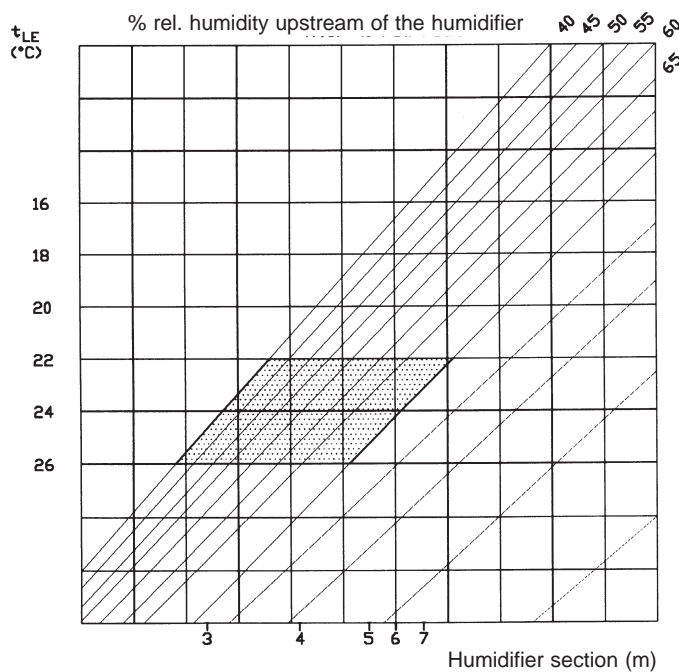
Water supply: Only demineralized water < 20 μ S/cm may be introduced into the humidifier as supply water. The water pressure to the humidifier should be between 0.5 bar and 6 bar, and the water temperature between 5°C and 40°C.

2.1 Humidifier section

The length of the humidifier section depends on various factors.

- > even distribution of the mist in the air flow
- > temperature of the air
- > rel. humidity of the air
- > air speed

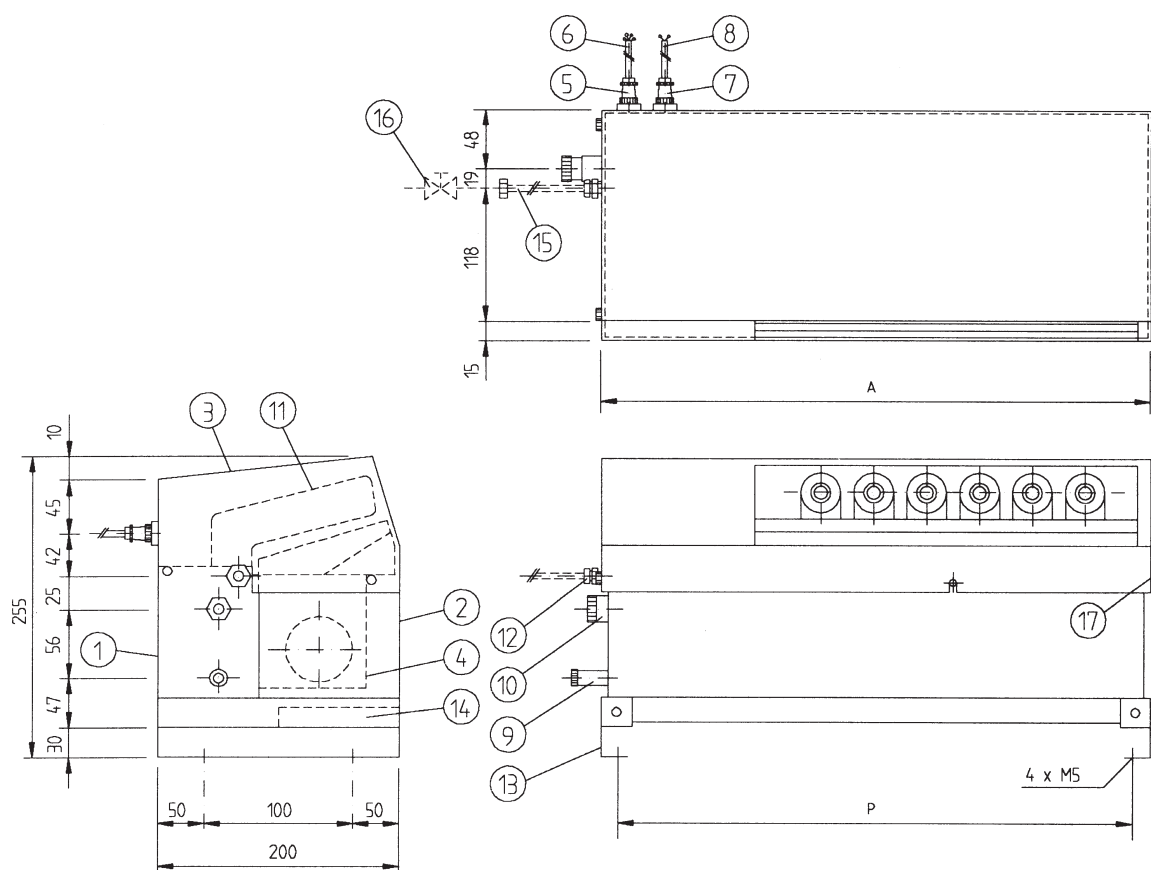
The diagram below for determining the length humidifier section contains recommended values depending on the most important parameters. The tolerance is ± 0.5 meters.



Use of a proportional control is another alternative for reducing the humidifier section. This reduces the output of the humidifiers as required for more than 90% of the operating time and thus reduces the humidifier section, preserves the transducers and maintains the even distribution of the mist even in part load operation.

- The measurement is made with the air flap control "max". The humidifier section reduces in the "min" position.
- The remainder of the mist stream can be seen on a black background over the specified sections.

2.2 Dimensional drawings



For dimensions A and P see Page 6 under “Dimensions”

Legend:

1	Humidifier unit	10	Safety overflow
2	Fan housing	11	Mist guide pipe
3	Mist guide cover	12	Ring and nut
4	Fan	13	Installation foot
5	Metal plug	14	Air filter
6	Cable	15	Water supply*
7	Metal plug	16	Shut-off valve*
8	Cable	17	Air flap controller
9	Water drain	*	<i>provided by customer</i>

2.3 Description of unit

Safety precautions

Automatic supply water monitoring by solenoid valve and float switch. Protective device against running dry; if the water drops below a preset level, the float switch and relay are automatically operated to switch off the power supply. A thermostat switches off the current, if the temperature in the air humidifier rises above a preset point. Fuses and varistors are installed to protect the electronics.

Description of the main components

1. Humidifying unit

Ultrasonic atomization modules, the solenoid valve and the float switches are accommodated in the high-quality steel housing.

2. ULTRASONIC atomization module

The compact ULTRASONIC atomization module is accommodated in the base of the water container. It contains the vibration generating circuit, an amplifier and a transducer. The resultant ultrasonic vibrations are directed towards the water surface. The water is atomized in this way.

3. Water supply solenoid valve and float switch

In order to achieve optimum atomization of the water. The water level in the container must be kept as constant as possible. In order to meet this condition, a solenoid valve and a float switch are used for automatic water supply control. With this equipment, if the water level in the container falls below the normal level, the float switch switches to ON and the solenoid valve opens, in order to release the water supply to the container. If the normal water level is reached, the float switch switches to OFF and the solenoid valve is closed.

4. Relay (external, in control box) and float switch (dry protection)

The transducer will be damaged if the humidifier is operated with a reduced water level. A float switch and a relay (in the control station) are interposed to prevent such an operating condition. If the water level falls below the safety level for any reason, the float switch switches to OFF, operates the relay and thus switches off the electrical power supply to the unit.

5. Fan

The mist generated in the water tank is carried into the room by the fan. A special design makes it possible to generate a variable supporting air flow in order to ensure rapid dispersal of the aerosols.

Air outputs

Model	BNB 1000	BNB 2000	BNB 3000	BNB 4000	BNB 5000	BNB 8000
Output* m ³ /min	1.2	1.8	2.4	3.6	4.2	6.6

* the values apply to a supply voltage of 48 V / 50 Hz

3. Capacity calculation for ultrasonic air humidifiers

Example:

Humidification of a room with gap ventilation.

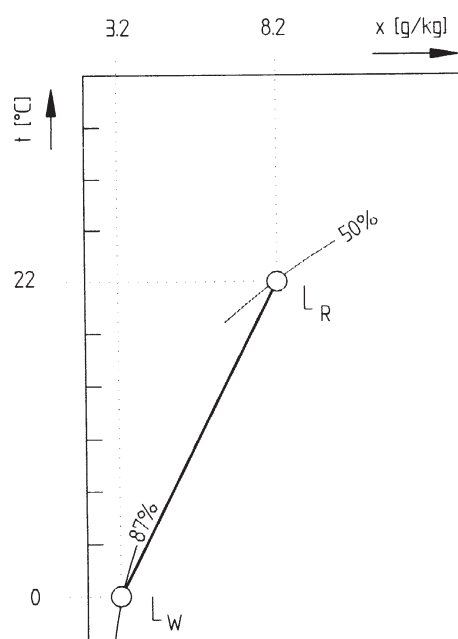
The following data is required to determine the humidifier output for rooms without a ventilation system:

	Example:
> Size of room (m) ³	500 m ³
> Temperature, humidity in room	22°C /50% rel.
> Conditions of outside air (temp., humidity)	0°C /87% rel.
> Estimate of gap ventilation (windows, doors)	500 m ³ /h

The gap ventilation for a new building where the door is opened < twice per hour is < 1 times the room volume

Calculation of humidifier output

Determine the ΔX from the room condition and the outside air condition in the h/x diagram



Determine the air quantity which is to be humidified by 5 g/kg.

The example involves an air change/hour

Size of room 500 m³ x 1 air change x 1.2 air density = 600 kg/hour

Humidifier output

Weight of air x Δx = humidifier output required

600 kg/hour x 5 g/kg air = 3000 g/hour humidifier output required

Note:

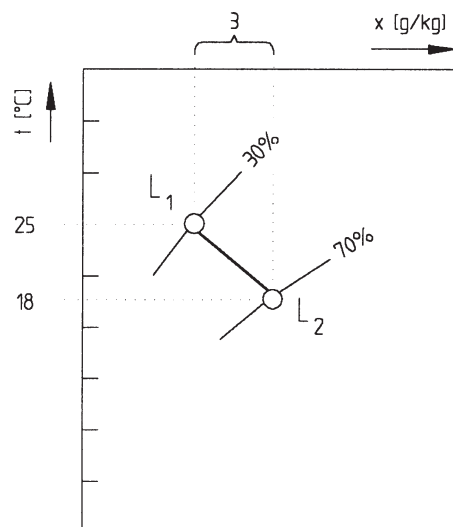
STULZ ULTRASONIC humidifiers atomize the water into the smallest water droplets ($< 0.001 \text{ mm}$).

The mist thus generated (aerosols) extracts the heat out of the ambient air (enthalpy) and changes its state from liquid to gaseous.

The ambient air is cooled down by this “adiabatic” behaviour (heat extraction from the ambient air).

Example:

- Air condition before humidification: Temperature 25°C
relative humidity 30%
- Humidity added of $\Delta x = 3 \text{ g/kg}$



Air condition after humidification: Temperature 18°C
relative humidity 70%

3.1 Questionnaire about ultrasonic humidification systems

Please use the following questionnaire for planning a STULZ ultrasonic humidifier system.

QUESTIONNAIRE

about ultrasonic humidification systems



Room temperature specified value _____ °C Room humidity specified value _____ % R.H.
 Room volume _____ m³ Height _____ m Width _____ m Length _____ m
 Ventilation system ☐ yes ☐ no Quantity of air _____ m³/h
 Is the supply air humidified ☐ yes ☐ no Fan stages- _____ Number
 Supply air temperature _____ °C Supply air humidity _____ % R.H.
 Heat load in room _____ kW Outside air proportion _____ %

Possible types of installation of humidifier

☐ Monobloc ☐ Duct ☐ Room [make a sketch]
☐ Suction side ☐ Pressure side Wall consoles ☐ yes ☐ no
 Operating times: _____ hours/d _____ d/W _____ W/a

Control

Present ☐ yes ☐ no Make/type _____
☐ continuous (signal _____) [V,mA] ☐ on/off ☐ stages (number _____)
 Control cabinet ☐ new ☐ existing ☐ continuous ☐ on/off ☐ stages
 Only control parts for switchgear cabinet installation ☐ continuous ☐ on/off ☐ stages

Water treatment

Water treatment present ☐ yes ☐ no
 System ☐ softener ☐ partial water softener ☐ reverse osmosis ☐ ion exchanger
 Hardness _____ °dH Conductivity _____ µS/cm
 Make _____ Model _____
 Output _____ l/h _____ m³/h

See separate questionnaire for water treatment

Sender

Company: _____

Compiled by: _____

Date: _____

Signature _____

Code STT011

QUESTIONNAIRE

about ultrasonic humidification systems



Room temperature specified value _____ °C Room humidity specified value _____ % R.H.

Room volume _____ m³ Height _____ m Width _____ m Length _____ m

Ventilation system ☐ yes ☐ no Quantity of air _____ m³/h

Is the supply air humidified ☐ yes ☐ no Fan stages- _____ Number

Supply air temperature _____ °C Supply air humidity _____ % R.H.

Heat load in room _____ kW Outside air proportion _____ %

Possible types of installation of humidifier

☐ Monobloc ☐ Duct ☐ Room [make a sketch]

☐ Suction side ☐ Pressure side Wall consoles ☐ yes ☐ no

Operating times: _____ hours/d _____ d/W _____ W/a

Control

Present ☐ yes ☐ no Make/type _____

☐ continuous (signal _____) [V, mA] ☐ on/off ☐ stages (number _____)

Control cabinet ☐ new ☐ existing ☐ continuous ☐ on/off ☐ stages

Only control parts for switchgear cabinet installation ☐ continuous ☐ on/off ☐ stages

Water treatment

Water treatment present ☐ yes ☐ no

System ☐ softener ☐ partial water softener ☐ reverse osmosis ☐ ion exchanger

Hardness _____ °dH Conductivity _____ µS/cm

Make _____ Model _____

Output _____ l/h _____ m³/h

See separate questionnaire for water treatment

Sender _____

Company: _____

Compiled by: _____

Date: _____ Signature _____

Code STT011

4. Switching operation and control

An external switchgear cabinet must be provided for operating the ultrasonic air humidifiers. As well as the transformer required for operation, the switchgear cabinet must contain contactor relays, the master switch, terminal strips and if necessary the proportional adapter, controller or the conductivity measuring instrument.

The control of the air humidifiers can be operated two-point (ON-OFF) or proportional. The control is to be suitably adapted to the project in each case.

When wiring the switchgear cabinet, the suppressor diodes supplied are to be switched parallel to the vibrator printed circuit boards to protect the transducers. In addition the contactor supplied for the bath feedback (level of water container) must still be used and connected to the RC element supplied. Other contactor coils cause irreparable damage to the float switch.

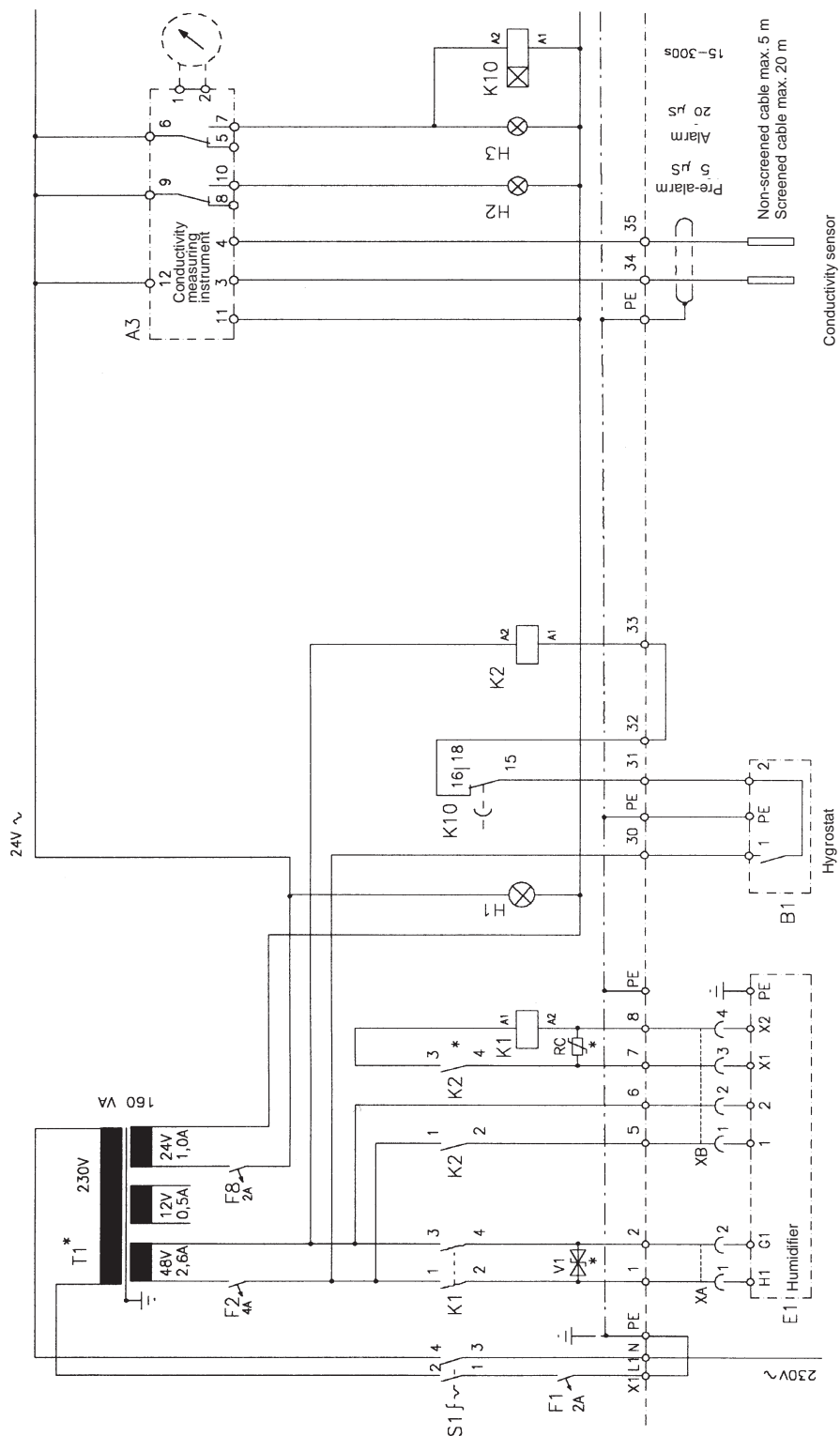
Defective wiring of the switchgear cabinet may lead to a defect in the humidifier, therefore the switchgear cabinets are to be wired in accordance with the wiring diagrams made available.

The parts supplied by STULZ are identified with * in the wiring diagram.

4.1 Design of the two-point (ON-OFF) control

The most simple type of control is via a hygrostat which compares the room humidity value (actual value) with the set value (specified value). If the actual value is below the specified value, the hygrostat switches on the humidifier, if the value is above this, the unit is switched off. The control process runs with a predetermined switching hysteresis around the specified value.

BNB 1000 ON/OFF CONTROL

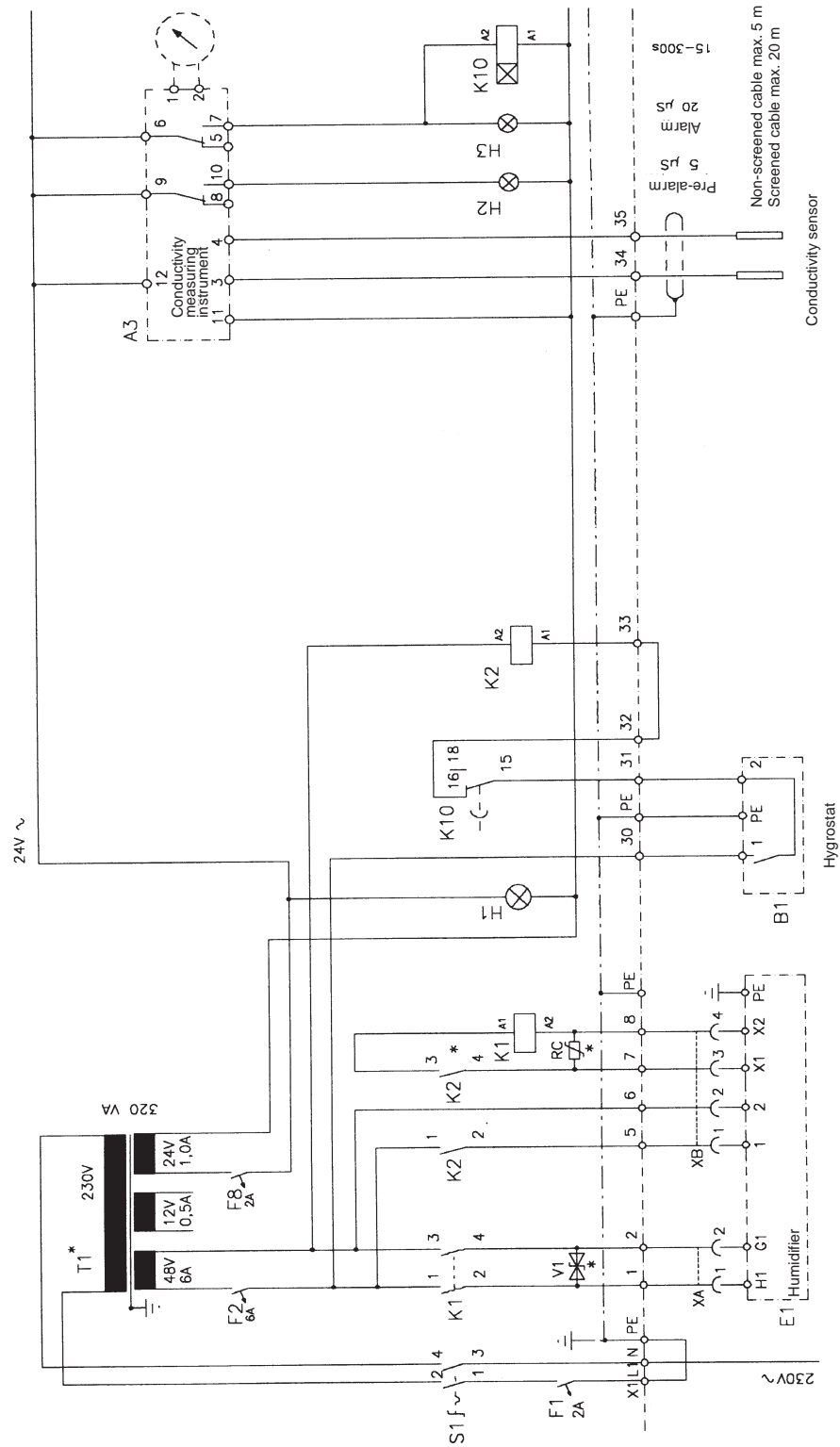


Switchgear cabinet for
Ultrasonic - BNB 1000

The parts supplied by STULZ
are identified with *

Ultrasonic - BNB 1000

BNB 2000 - 3000 ON/OFF CONTROL

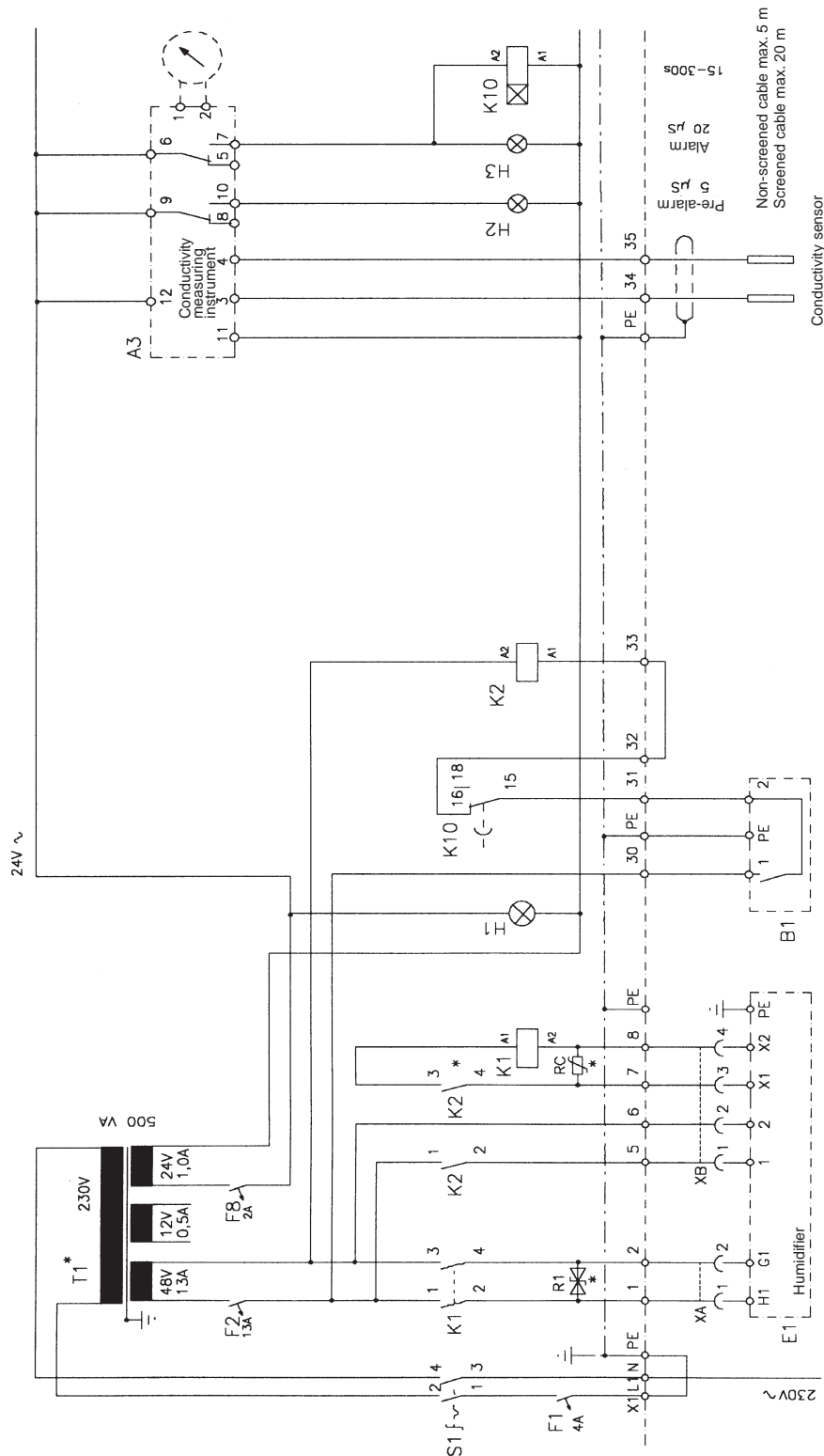


Switchgear cabinet for
Ultrasonic - BNB 2000
Ultrasonic - BNB 3000

The parts supplied by STULZ are identified with *

Ultrasonic - BNB 2000
Ultrasonic - BNB 3000

BNB 4000 ON/OFF CONTROL

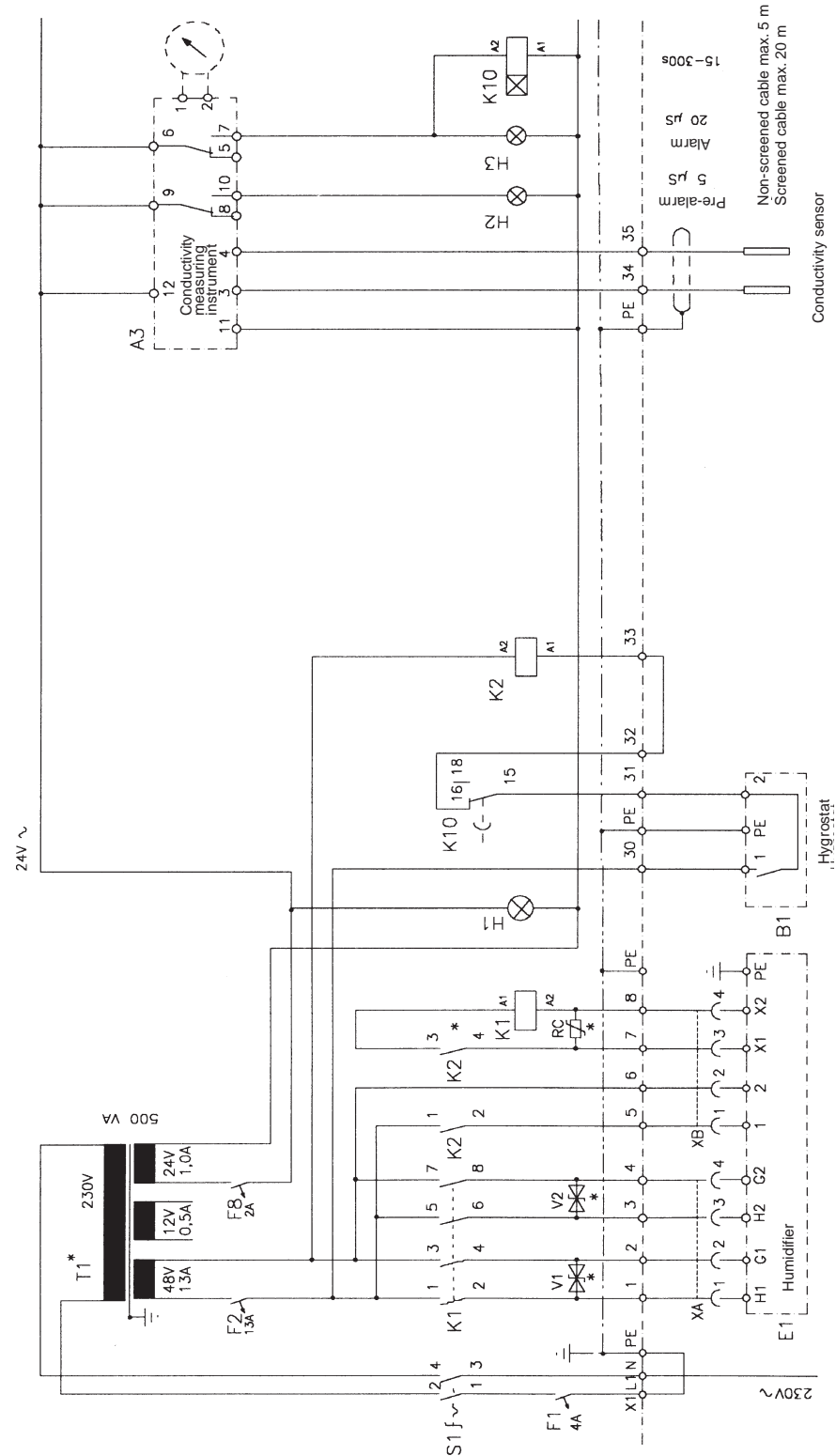


Switchgear cabinet for
Ultrasonic - BNB 4000

The parts supplied by STULZ
are identified with *

Ultrasonic - BNB 4000

BNB 5000 ON/OFF CONTROL

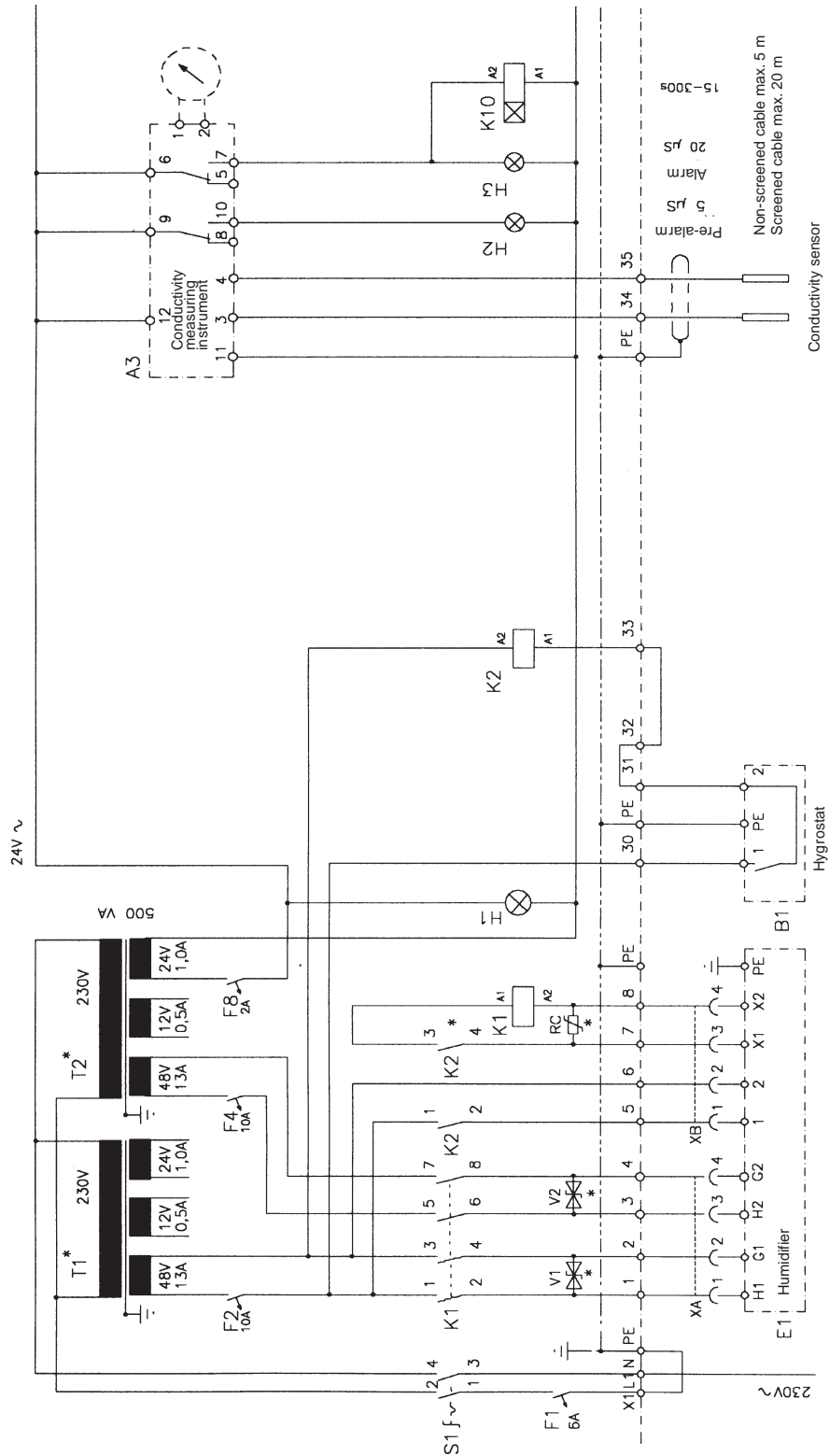


Switchgear cabinet for
Ultrasonic - BNB 5000

The parts supplied by STULZ are identified with *

Ultrasonic - BNB 5000

BNB 8000 ON/OFF CONTROL



Switchgear cabinet for
Ultrasonic - BNB 8000

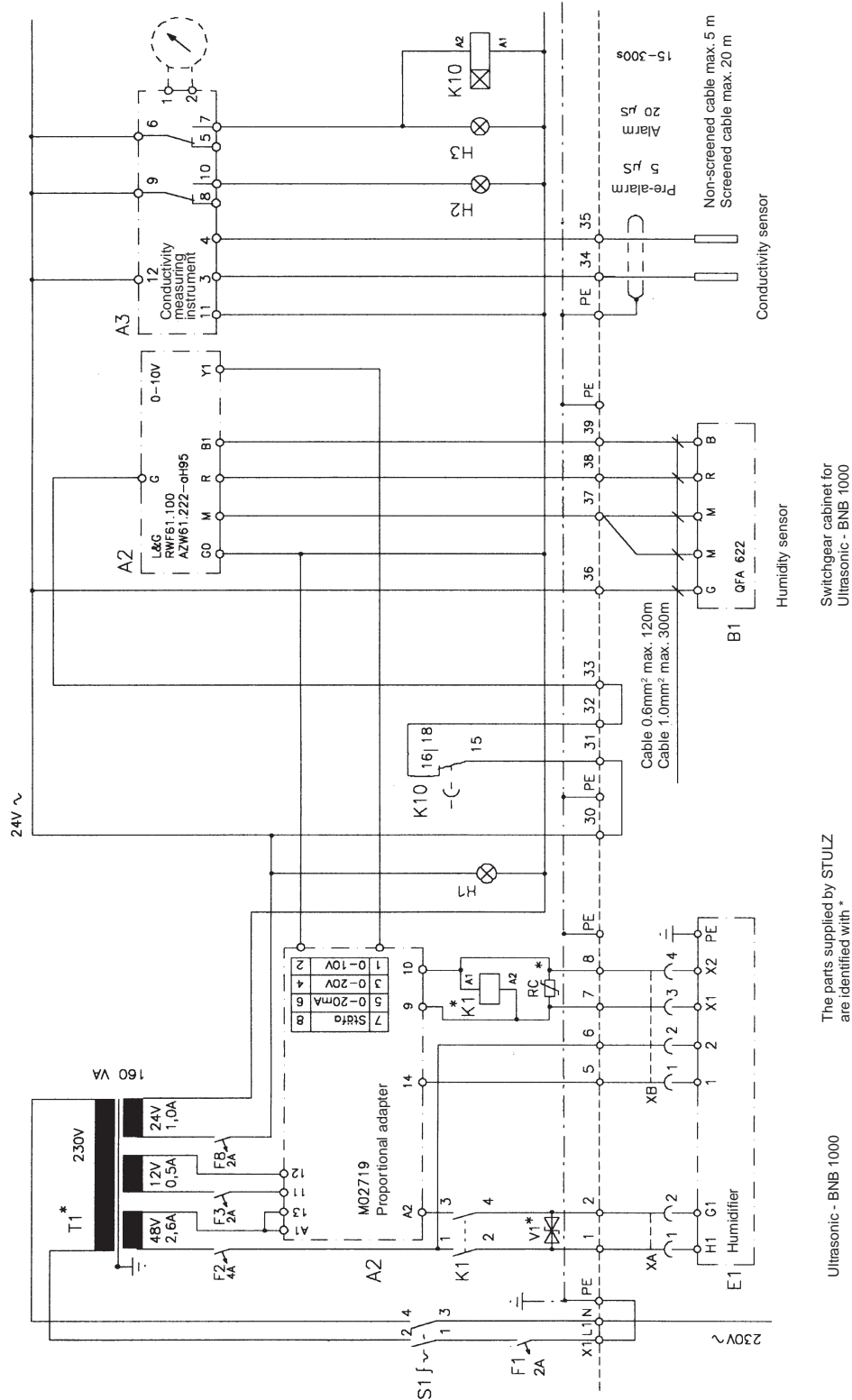
The parts supplied by STULZ are identified with *

Ultrasonic - BNB 8000

4.2 Design of proportional control

With proportional control, the actual value is compared with the specified value and the humidifier output adjusted corresponding to the resultant control difference. The proportional control consists of a humidity sensor, the continuous-action controller as well as the STULZ proportional adapter, which represents the interface between the humidifier and control components.

BNB 1000 PROPORTIONAL CONTROL

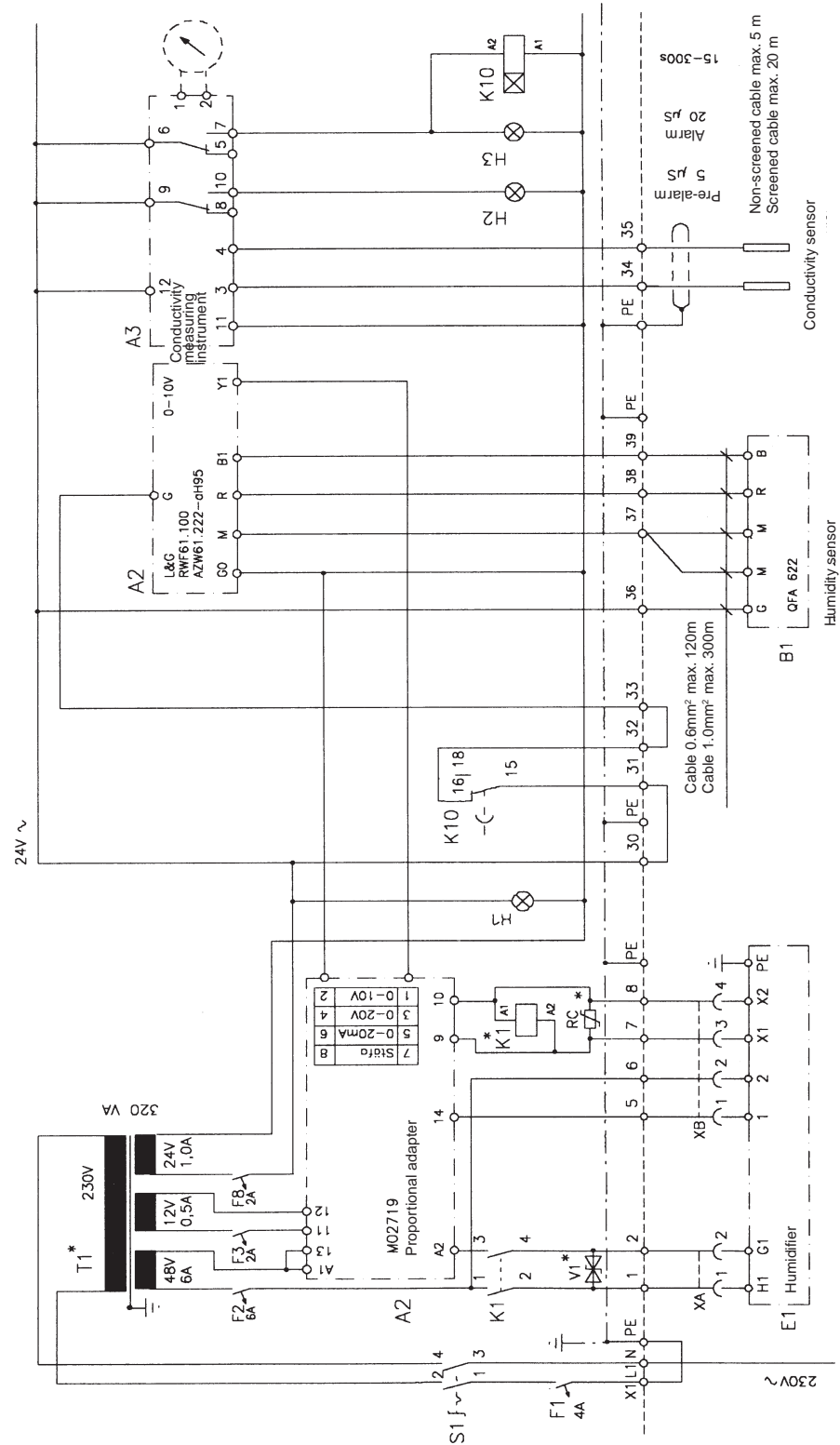


The parts supplied by STULZ are identified with *

Ultrasonic - BNB 1000

Switchgear cabinet for Ultrasonic - BNB 1000

BNB 2000 - 3000 PROPORTIONAL CONTROL

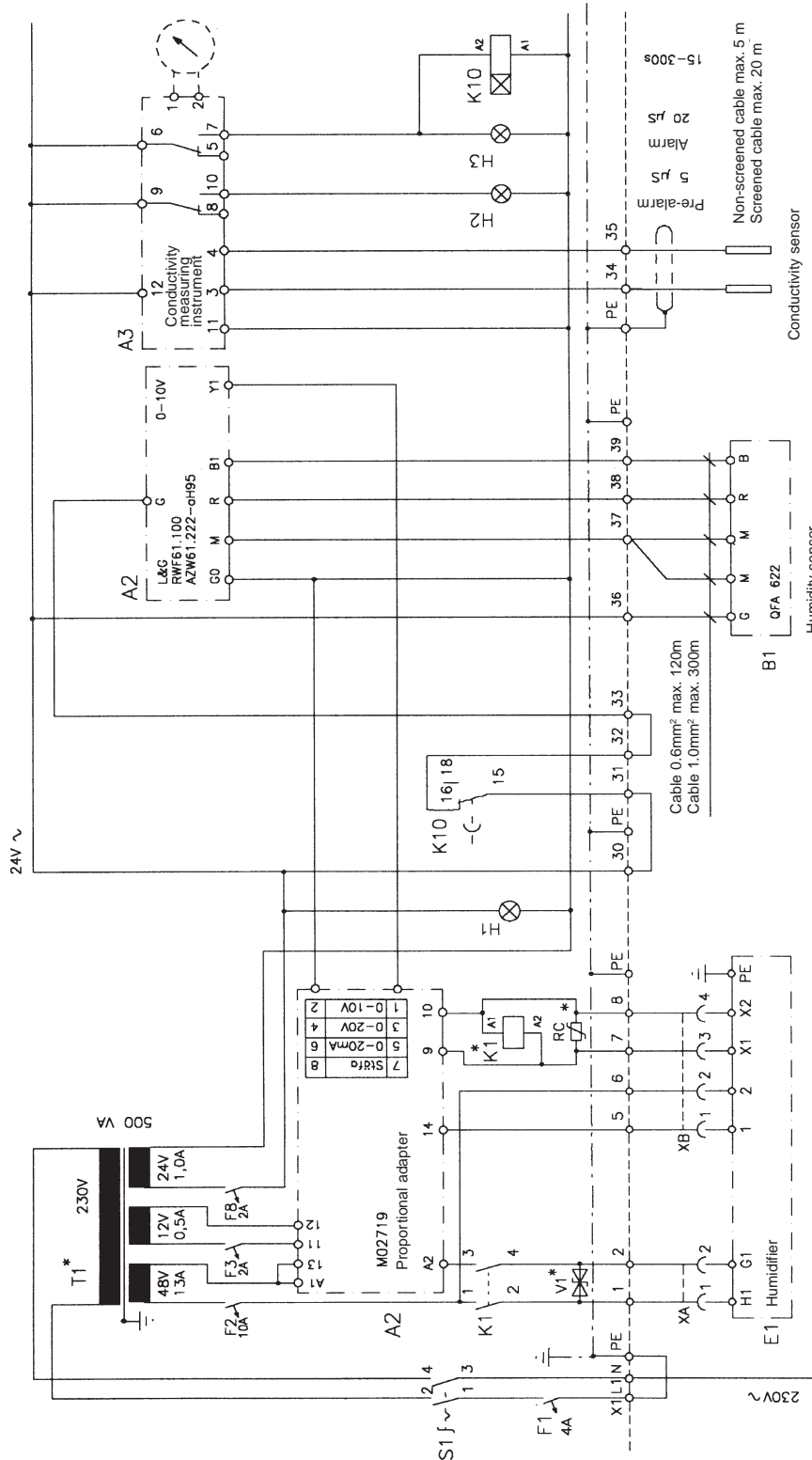


The parts supplied by STULZ are identified with *

Ultrasonic - BNB 2000
Ultrasonic - BNB 3000

Switchgear cabinet for
Ultrasonic - BNB 2000
Ultrasonic - BNB 3000

BNB 4000 PROPORTIONAL CONTROL

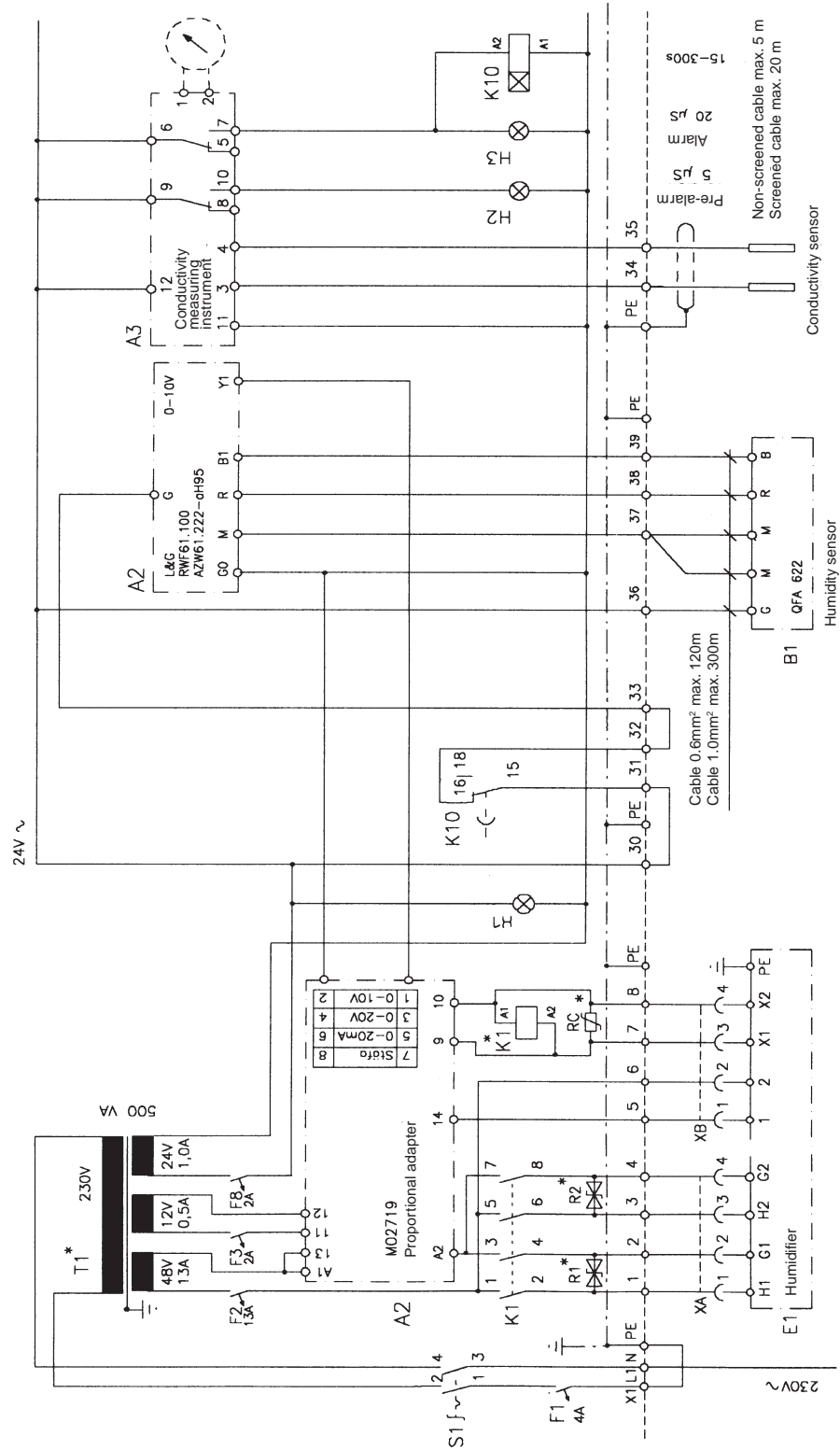


The parts supplied by STULZ
are identified with *

Ultrasonic - BNB 4000

Switchgear cabinet for
Ultrasonic - BNB4000

BNB 5000 PROPORTIONAL CONTROL



The parts supplied by STULZ
are identified with *

Ultrasonic - BNB 5000

Switchgear cabinet for
Ultrasonic - BNB5000



Ultrasonic - BNB 8000

Switchgear cabinet for
Ultrasonic - BNB8000

4.3 Method of operation of the proportional adapter

1. General

The M 02719 (P adapter) proportional adapter is an output unit which varies its ON-time proportionally depending on four different controller inputs.

2. Function

After the threshold value of 1.2 VDC (or 1.2 mADC) is exceeded, the relay switches on the water supply valve at terminals 13 and 14 (see electrical diagram, proportional adapter M02719). A prerequisite for this is that the supply voltage of 12 VAC is applied to terminals 11 and 12. If then the bath feedback (level of water container) of 48 VAC/50Hz takes place at terminal 9 and 10 of the proportional adapter, the green LED lights up. At the same time the solid state relay starts to operate with an ON-time of 10%. This is displayed by the red LED flashing.

It is possible to adjust the ON-time cycle between 1 sec. and 3 sec. with the DIP switches on the printed circuit board of the proportional adapter.

ON-time cycles (second(s))	Position of DIP switches				Switch position
1	1=OFF	2=OFF	3=ON	4=ON	UP=OFF
2	1=ON	2=OFF	3=OFF	4=ON	DOWN=ON
3	1=ON	2=ON	3=OFF	4=OFF	

An increasing value at the input of the P adapter causes an extension of the ON-time of the output. All inputs are isolated.

The ON-time of 100% is achieved when the maximum value specified is achieved at one of the inputs.

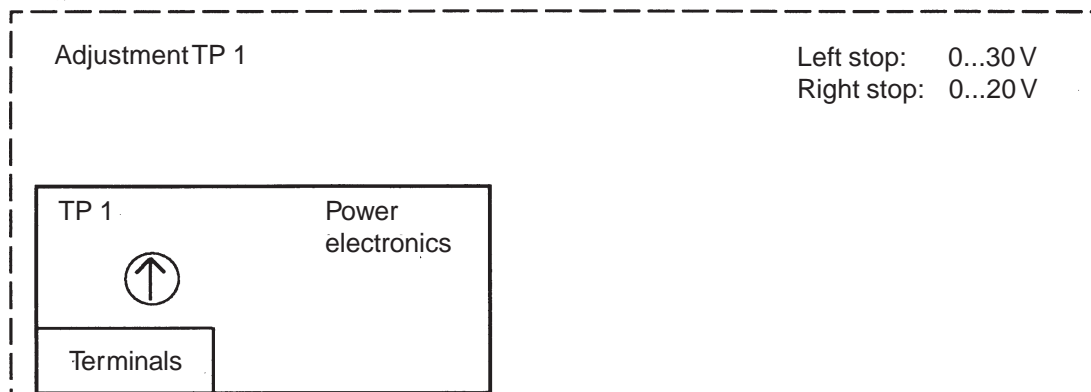
3. Technical data

Electrical power consumption:	1 W
Power loss at 100% ON-time:	21 W (at 21 A eff.)
Load voltage:	24 - 280 V eff.
Peak off-state voltage:	600 V
Leakage current (at 280 V eff.):	8 - 15 mA eff.
Switching on/off characteristics:	switching zero voltage
Dielectric strength of electrical isolation:	min. 2500 V eff.
Insulation resistance:	50 MOhm
Operating temperature:	0...+80°C
Max. heat sink temperature:	horizontal 63°C
	vertical 55°C

Connection assignment

Terminal 1	+0... 10 V DC	}	Polarity reversal protected controller input
Terminal 2	GND		$R_{in} = 20 \text{ k}\Omega$
Terminal 3	+0...20 V DC	}	Polarity reversal protected controller input
Terminal 4	GND		$R_{in} = 40 \text{ k}\Omega$
Terminal 5	+0...20 mA DC	}	Polarity reversal protected controller input
Terminal 6	GND		$R_{in} = 1 \text{ k}\Omega$
Terminal 7	+0...20 (30) V AC	}	Electrically isolated controller input
Terminal 8	GND		$R_{in} > 150 \text{ k}\Omega$, via TPI* adjustable to 20/30 V
Terminal 9	Bath feedback	}	Humidifier feedback
Terminal 10	Bath feedback		Release by water level 48 VAC/50Hz
Terminal 11	Supply voltage	}	12 V AC supply voltage
Terminal 12	Supply voltage		of the P adapter ~1W
Terminal 13	Input 48 VAC	}	Floating relay contact
Terminal 14	Output		for water inlet valve
Terminal A1	Input 48 VAC	}	Isolated electronic alternating voltage zero-switch
Terminal A2	Output		Load 24...280 V AC/50 Hz 21 A Continuous load 40 A briefly

*



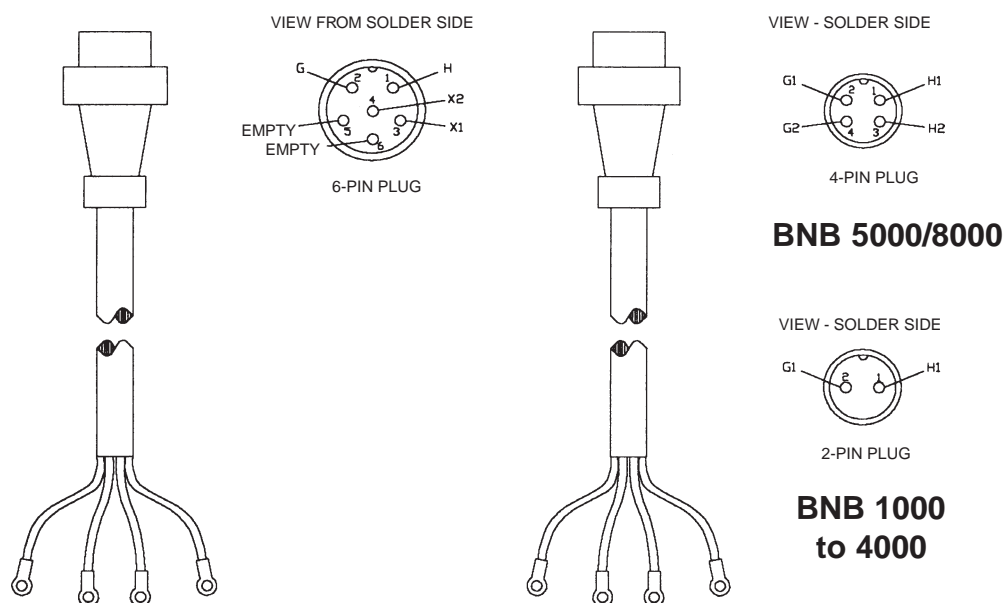
4.4 Connecting cables between the humidifiers and the switching operation and control

1. ON/OFF Control/proportional control

The preassembled cables which are 2 metres long and provided with a plug are plugged into the sockets provided in the units and are screwed together.

Recommendations for cable dimensioning (see 3.) should be taken into account for an extension of the connecting cables.

2. Preassembled cable



3. Cable dimensioning

The connecting cable between the humidifier and the control box (transformer) reduces the voltage at the humidifier in accordance with the following formula:

$$i = \frac{35.6 \times L \times I}{1000 \times A}$$

i = voltage drop [V]
L = cable length [m]
I = current [A]
A = cross-section of cable [mm²]

If the voltage drop between the control box and the humidifier is less than or equal to 4%, the voltage value is still within the tolerance range. However, if this voltage value is not achieved, a larger cable cross-section must be selected corresponding to the table or the voltage on the secondary side of the transformer must be changed to 52 VAC.

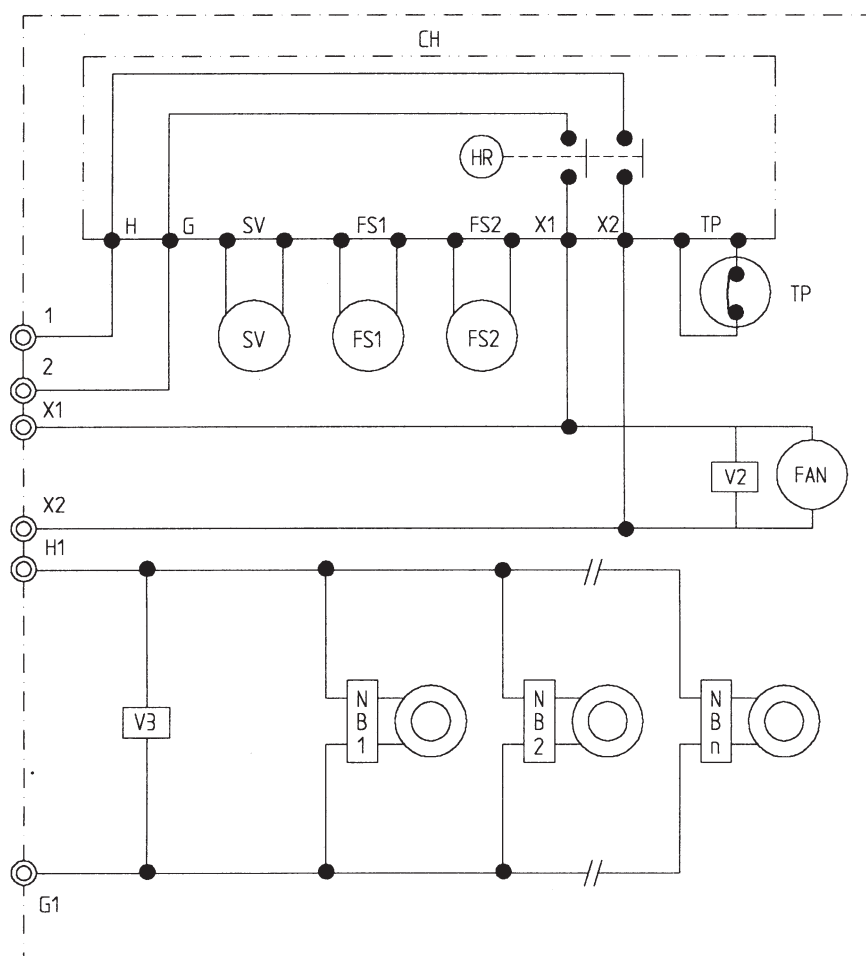
Type	Voltage	Current	Max. cable length 1.5 mm ²	Max. cable length 2.5 mm ²
BNB 1000	48 VAC	2.08	39 m	65 m
BNB 2000	48 VAC	3.75	22 m	36 m
BNB 3000	48 VAC	5.20	16 m	26 m
BNB 4000	48 VAC	7.08	12 m	19 m
BNB 5000	48 VAC	2 x 4.48	18 m	30 m
BNB 8000	48 VAC	2 x 6.98	12 m	19 m

The transducers are supplied via two separate strands on the BNB 5000 and BNB 8000, the current dividing and the maximum cable length increasing for a standard cross-section.

4.5 Electrotechnical information on BNB

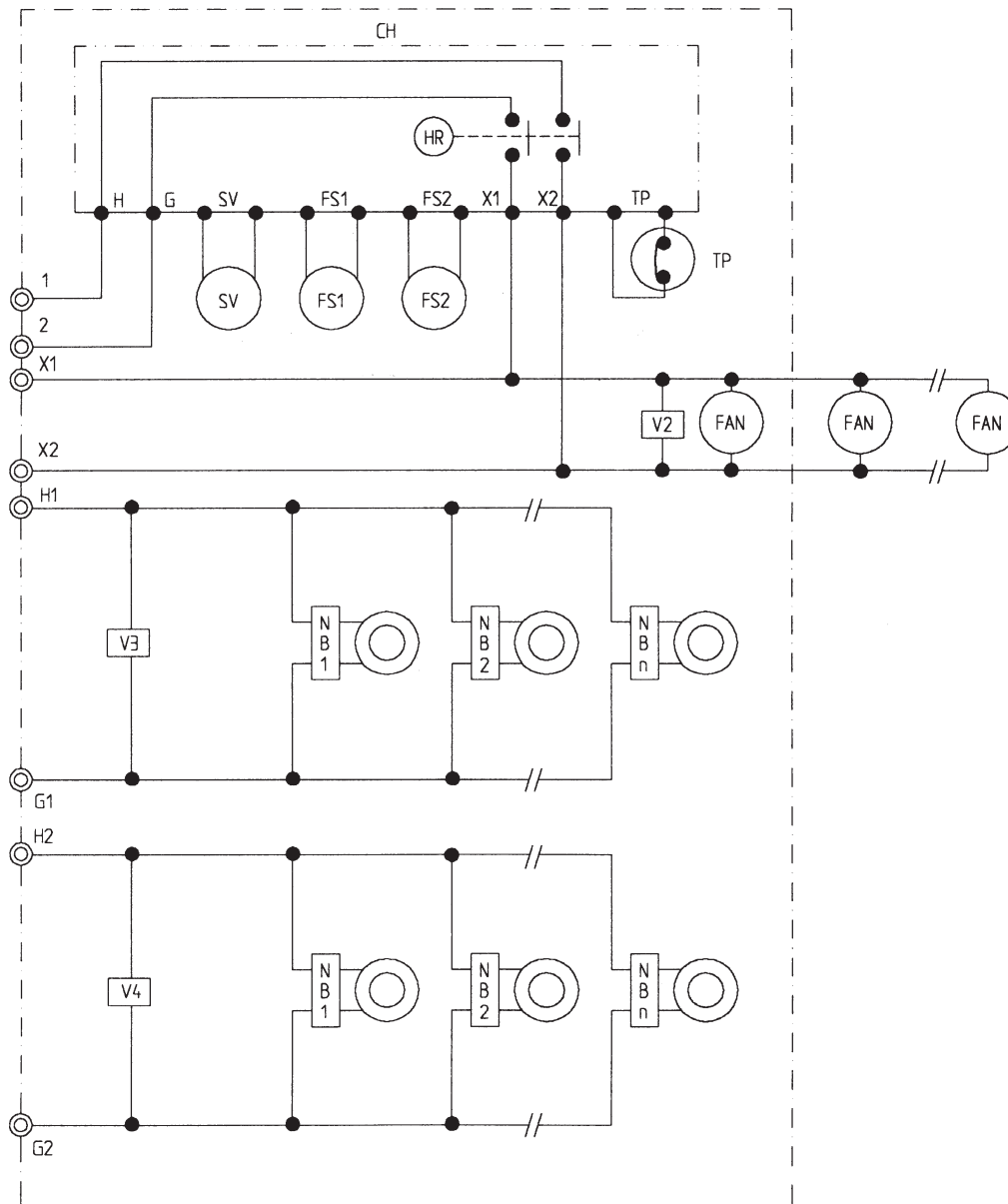
Internal wiring

BNB 1000, 4000



Legend:

V2-4	Varistor
CH	Relay plate
HR	Auxiliary relay
SV	Solenoid valve
FS1	Float switch for water supply
FS2	Float switch for low water level
TP	Thermostat
FAN	Fan
NB1..n	Ultrasonic atomization module

BNB 5000, 8000

Legend:

V2-4	Varistor	FS1	Float switch for water supply
CH	Relay plate	FS2	Float switch for low water level
HR	Auxiliary relay	TP	Thermostat
SV	Solenoid valve	NB1..n	Ultrasonic atomization module
FAN	Fan		

5. Assembly, commissioning and application limits



When planning and assembling the ultrasonic humidifiers, it is imperative that all materials which come into contact with the deionized water are resistant to deionized water. The most important materials can be obtained from the following table.

Materials for deionized water

Material	Maximum temperature
High-quality steel (1.4571)	> 100°C
PVC (polyvinylchloride)	60°C
PP (polypropylene)	> 100°C
PVDF (polyvinylidene fluoride)	> 100°C
PA (polyamide)	60°C
PSO (polyethylene)	60°C

Application limits:

Water quality	=	< 5 $\mu\text{S/cm}$, briefly up to 20 $\mu\text{S/cm}$
Voltage SOAC*	=	380 V \pm 10% or 220 V \pm 10%
Humidifier voltage	=	48 V \pm 10%
Water pressure	=	0.5 bar to 6 bar upstream of humidifier
Water temperature	=	8°C to 40°C
Air humidity	=	\leq 90% R.H

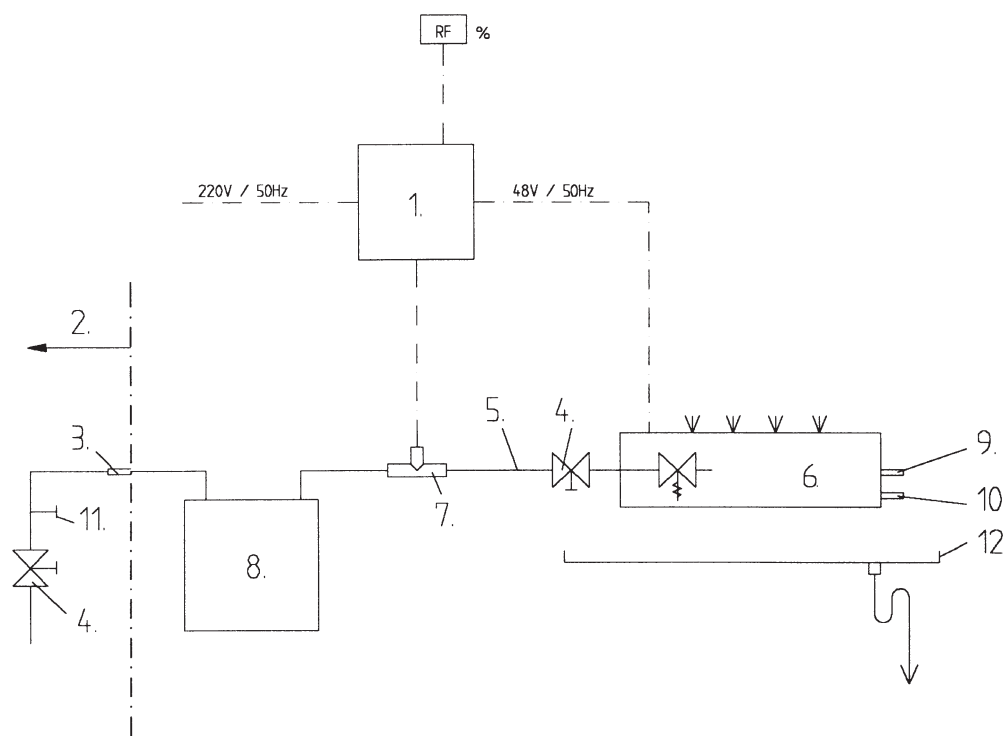
* SOAC = Switching operation and control

In the case of exceptionally high dust levels in the air (e.g. silicon dust in printing plants), the air must be filtered as dust deposits on the water reduce the output of the humidifier.

5.1 Installation of BNB model range

- 1) The unit must be mounted or installed so that the mist blown out by the fan is distributed evenly in the entire room.
- 2) The following notes are particularly to be complied when installing/assembling:
 - a) The unit must be installed in a totally horizontal position.
 - b) Between the mist blasting and each component, which may be upstream of the unit, a free area must be kept which is longer than the humidifier section (see Page 7).
 - c) A free area of at least 50 cm must be left between the upper edge of the humidifying unit and the lower edge of the ceiling.
- 3) If the humidifying unit is mounted or installed at a high point, a platform is to be provided for maintenance and inspection purposes.

Installation diagram



Legend for installation diagram

1. Control station
2. *Provided by customer*
3. Connection 3/4" external thread (flat-sealing)
Provide for continuous pipe interruptor
4. Hand-operated valve
5. High-quality steel pipe, 6 mm dia. (1.4571)
6. Ultrasonic humidification
7. Measuring electrode
8. Water treatment system (ion exchanger/reverse osmosis system)
9. Overflow
10. Water drain
11. Provide drainage
12. Condensate tray, V4A

Attaching the hygostat

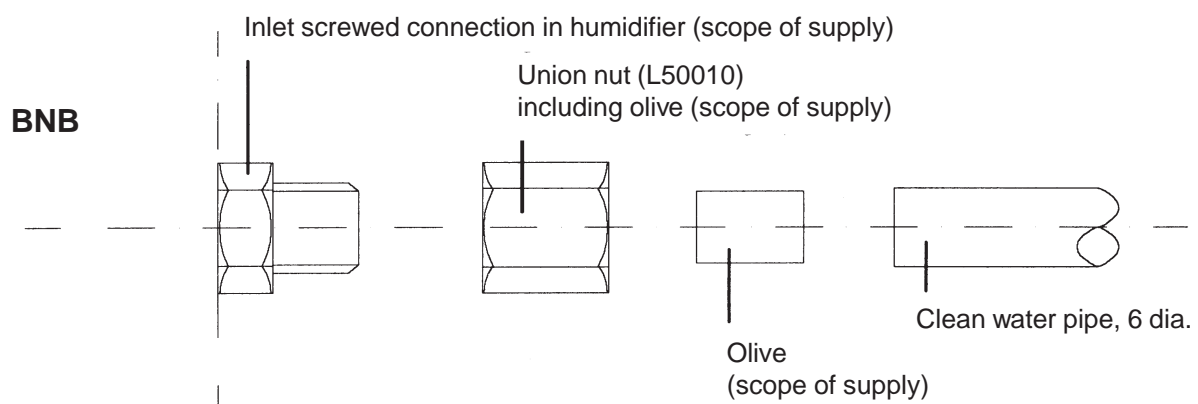
- 1) The hygostat should be attached to the wall where the relative humidity can be properly measured, where the through-ventilation is good and where the hygostat can be operated/set conveniently.

Water supply pipe(s)

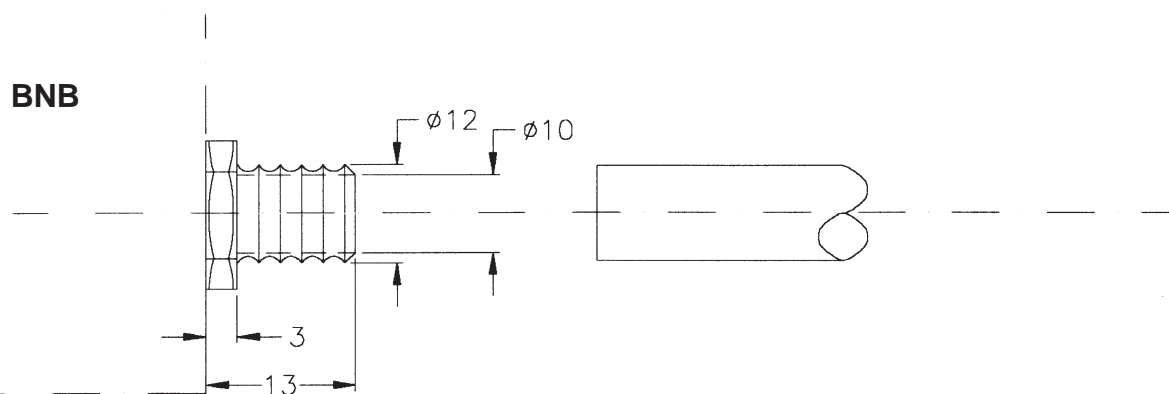
- 1) Deionized water of $< 5 \mu\text{S/cm}$ must be used for the humidifying unit. A shut-off valve must be fitted to each unit. Admission pressure: 0.5 to 6 bar.
- 2) The deionizing system must be connected to the humidifier with a material which is resistant to deionized water (e.g. PE or high-quality steel (1.4571)).
- 3) Metal filings, swarf and dirt must not enter the water pipes. All pipes must be cleaned before connecting the pipes to the humidifying unit. The supply line can be in the pressure hose or high-quality steel pipe depending on the safety risk.
- 4) The overflow pipe must be connected as a safeguard. However, no water flows into the overflow during normal operation.
- 5) Local water regulations are to be complied with.

Connections on the water side to the BNB humidifiers. The position of the connections and further unit dimensions can be found under Item 2.2.

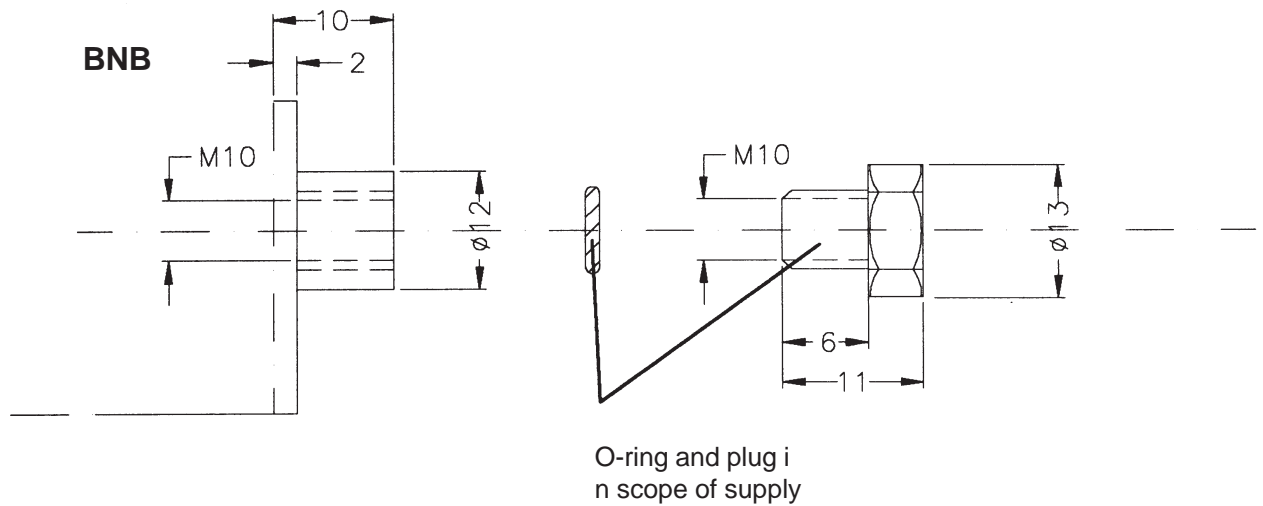
Water supply line



Overflow

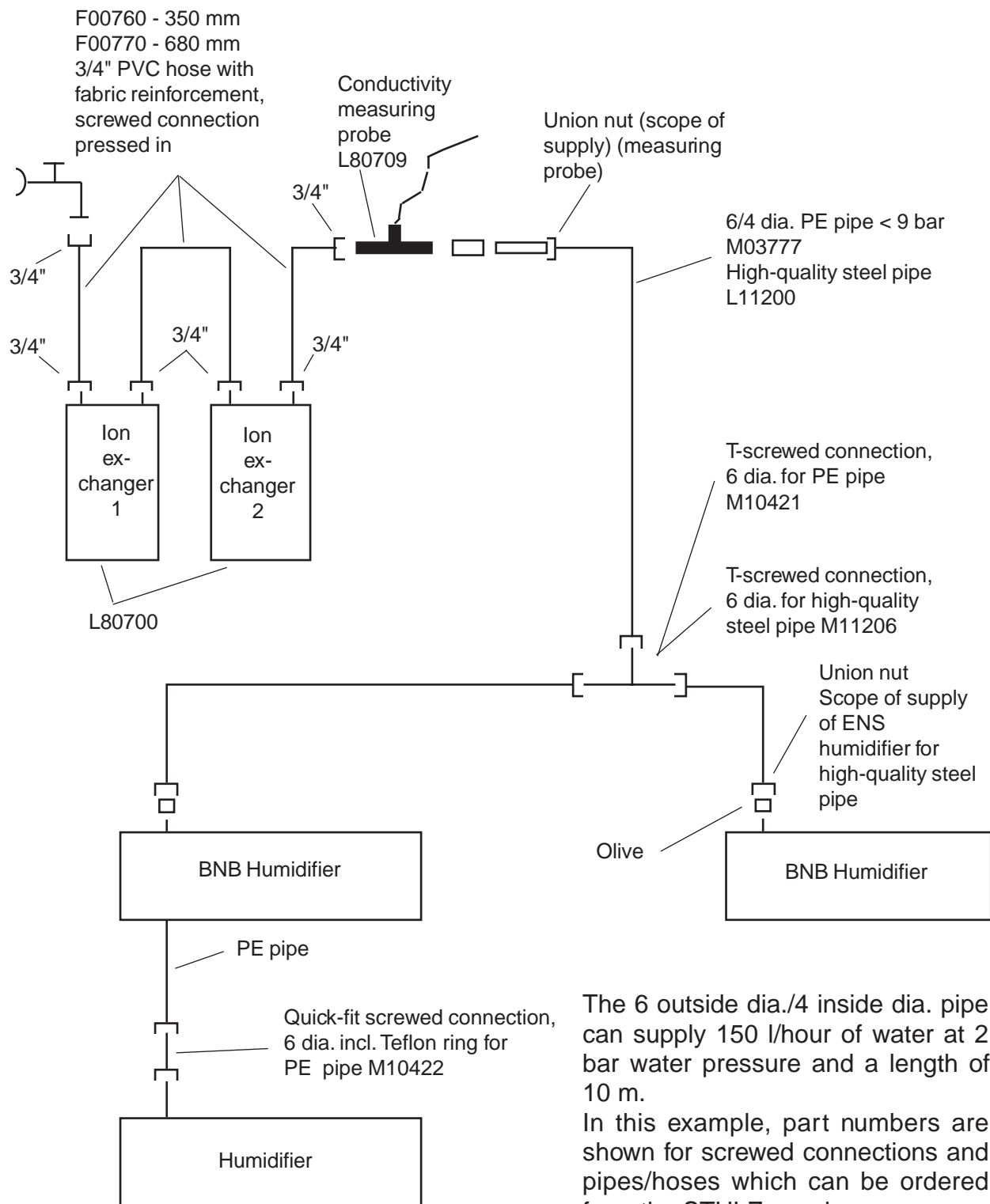


Drain

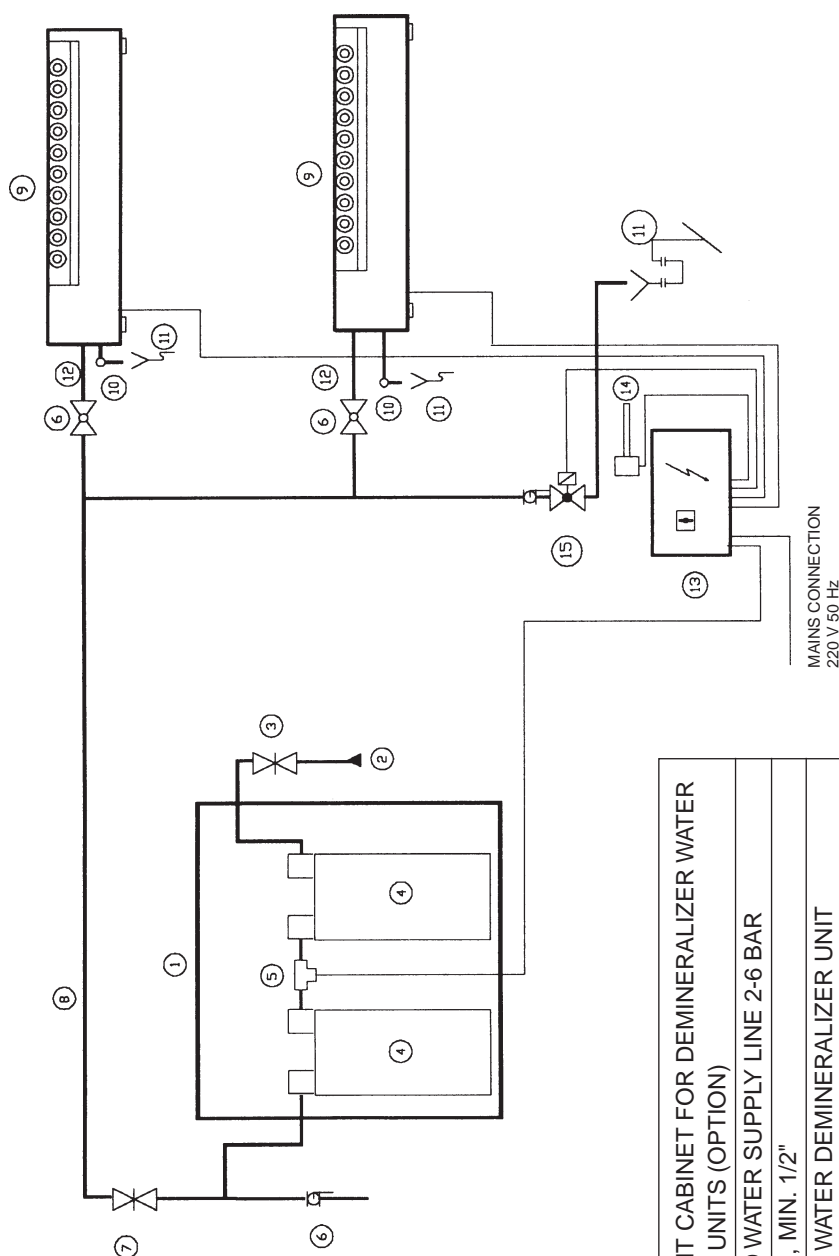


Connection of a drain line with solenoid valve is only necessary if for particular hygiene regulations, draining of the water is required in the event of a longer OFF-time of the humidifier.

Piping example



Examples for the installation of BNB humidifiers Water demineralizer unit with 2N° ion exchangers in series



LEGEND

1	HALF-HEIGHT CABINET FOR DEMINERALIZER WATER CARTRIDGE UNITS (OPTION)
2	UNTREATED WATER SUPPLY LINE 2-6 BAR
3	STOP VALVE, MIN. 1/2"
4	CARTRIDGE WATER DEMINERALIZER UNIT
5	CONDUCTIVITY MEASURING PROBE
6	BALL VALVE (PVC OR CRST)
7	SHUT-OFF VALVE, CLEAN WATER PIPE (PVC OR CRST)
8	CLEAN WATER PIPE (PVC OR CRST)
9	ULTRASONIC MODEL BNB
10	SAFETY OVERFLOW
11	DRAIN
12	CLEAN WATER CONNECTION, 6MM CLAMPING RING
13	ULTRASONIC CONTROL CABINET
14	HYGROSTAT OR HUMIDITY SENSOR
15	AUTOMATIC CLEAN WATER PIPE PURGING (OPTION)

SPECIAL FEATURE FOR CLEAN ROOMS/EDP ROOMS WITH SPECIAL REQUIREMENTS ON CLEANLINESS OF THE MIST

The conductivity measuring probe (5) between the ion exchangers (4) ensures the system is switched off after the 1st ion exchanger is exhausted. Any breaking down of substances which are not recorded by the conductivity measurement (e.g. silicate), shortly before the ion exchanger is exhausted, is prevented by the 2nd ion exchanger.

Wiring

- 1) The operating voltage is 220 V, 50 Hz (control cabinet)
- 2) The power supply line is to be connected to the terminal block of the control station, i.e. L1 - N - PE.
- 3) There is a connection and wiring between the transformer and humidifying unit, conductivity measuring instrument, measuring electrode when the humidifier is delivered complete with control station and ion exchanger.
The wiring must be carried out in accordance with the wiring diagram in the case of partial deliveries. The regulations of the local electrical supply companies are to be complied with.

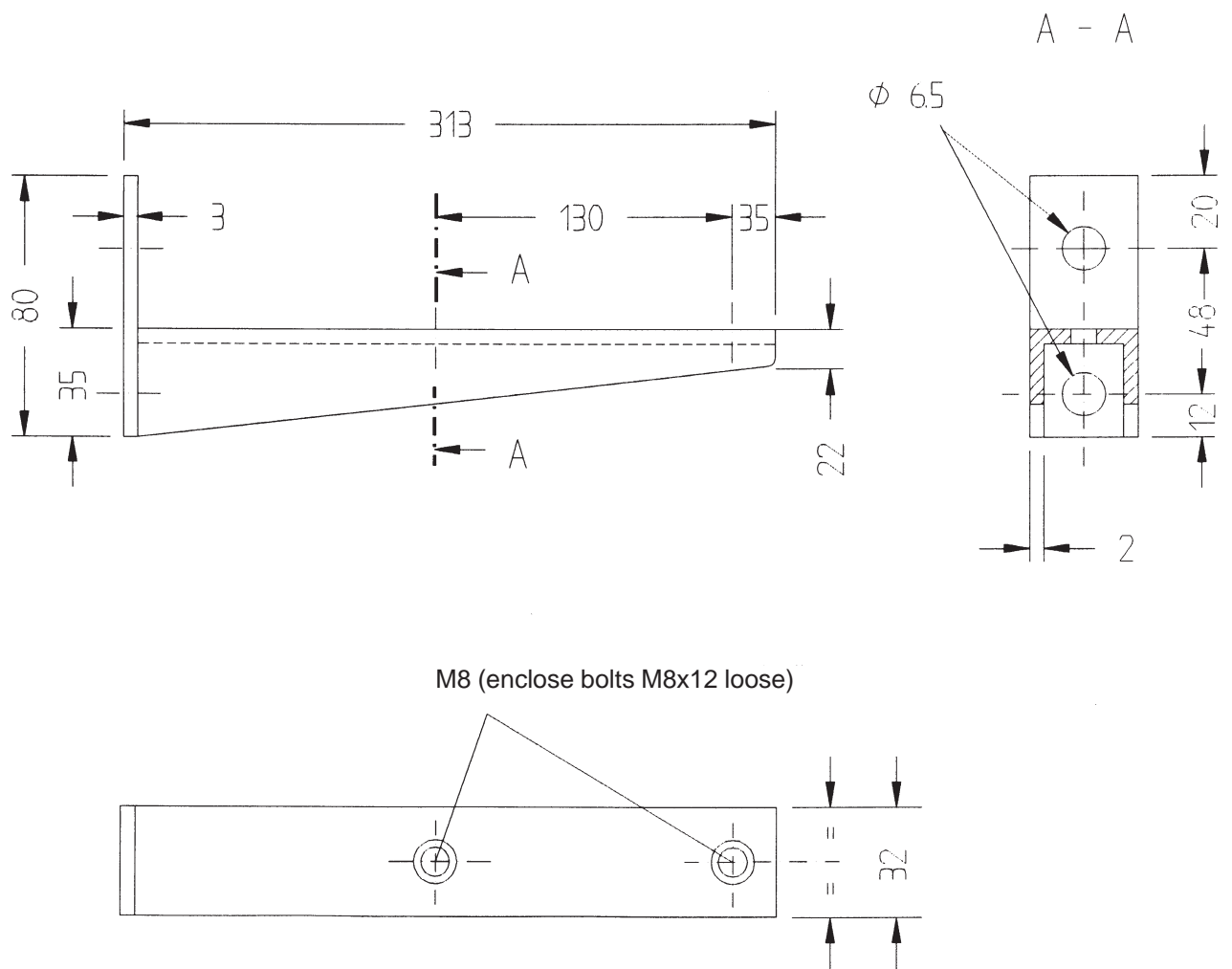
Wall mounting of humidifier

The BNB humidifier can be mounted on brackets (drawing no. 15) or in a tray (drawing no. 16).

Drawing no. 15

BNB bracket

Type: BNB 1000-8000
Material: CrNi 18.8 2/3 mm
M03182



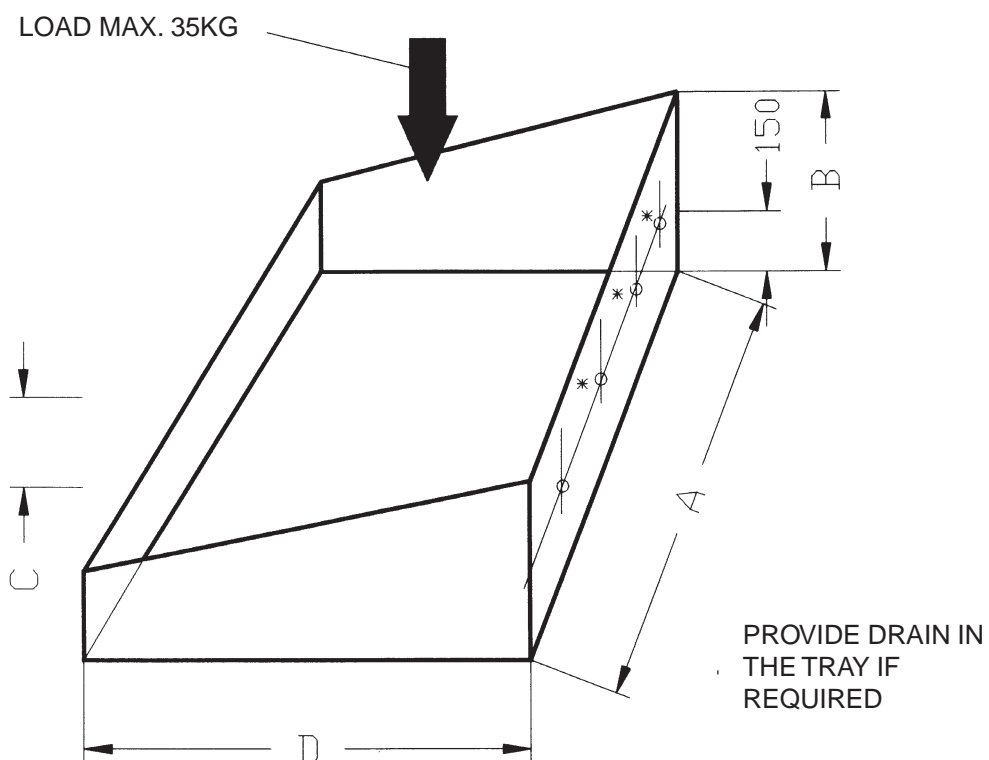
Drawing no. 16

TYPE	A	B	C	D	E
BNB 1000	440	200	50	320	3
BNB 2000	550	200	50	320	4
BNB 3000	660	200	50	320	5
BNB 4000	770	200	50	320	6
BNB 5000	880	200	50	320	7
BNB 8000	1210	200	50	320	8

VERSIONS:

CRNI 18.8 1.5MM
OR STEEL SHEET 1.5MM, STOVE-ENAMELLED PEARL WHITE

- * HOLES EVENLY DISTRIBUTED
MAKE D=8.5MM NUMBER OF HOLES
SEE UNDER "E"

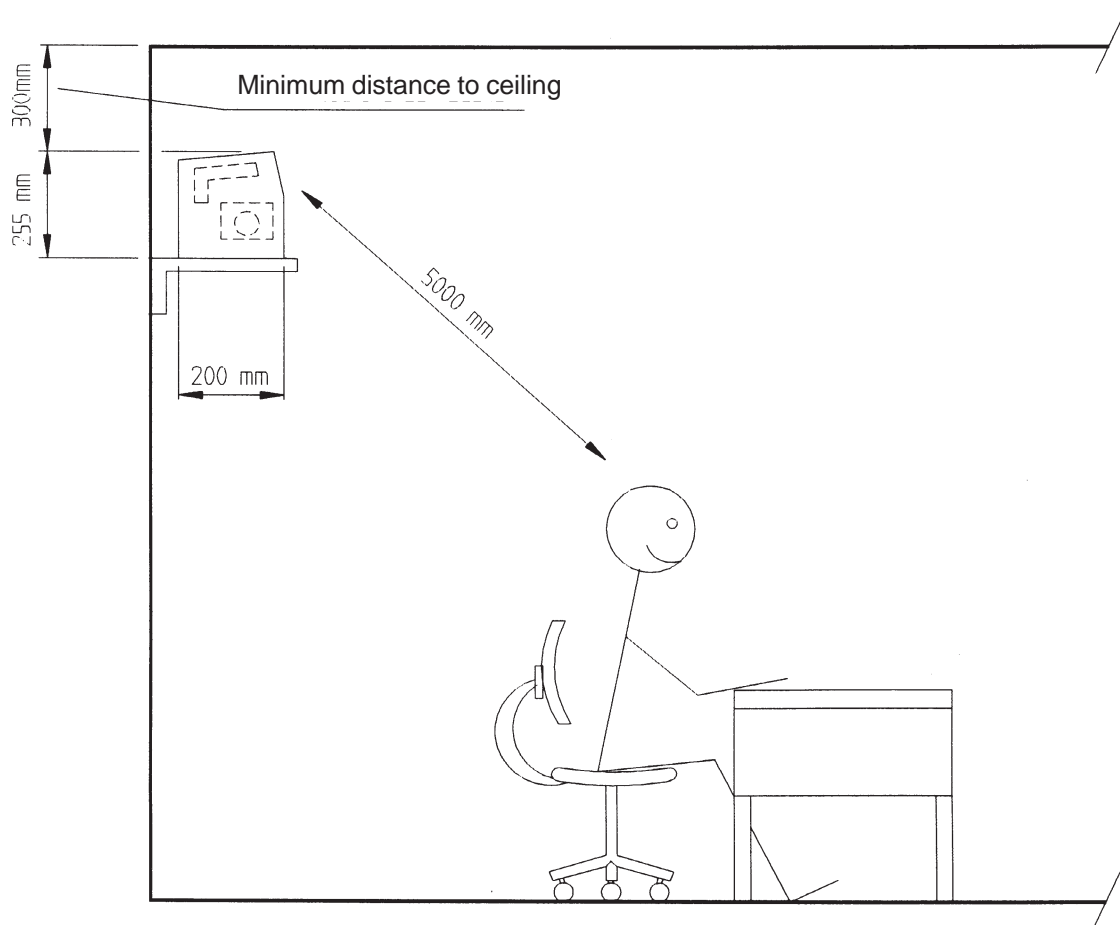


5.2 Examples for the mounting of BNB humidifiers

The following drawings No. 17 and 18 show the installation of a BNB water humidifier on brackets and in a tray.

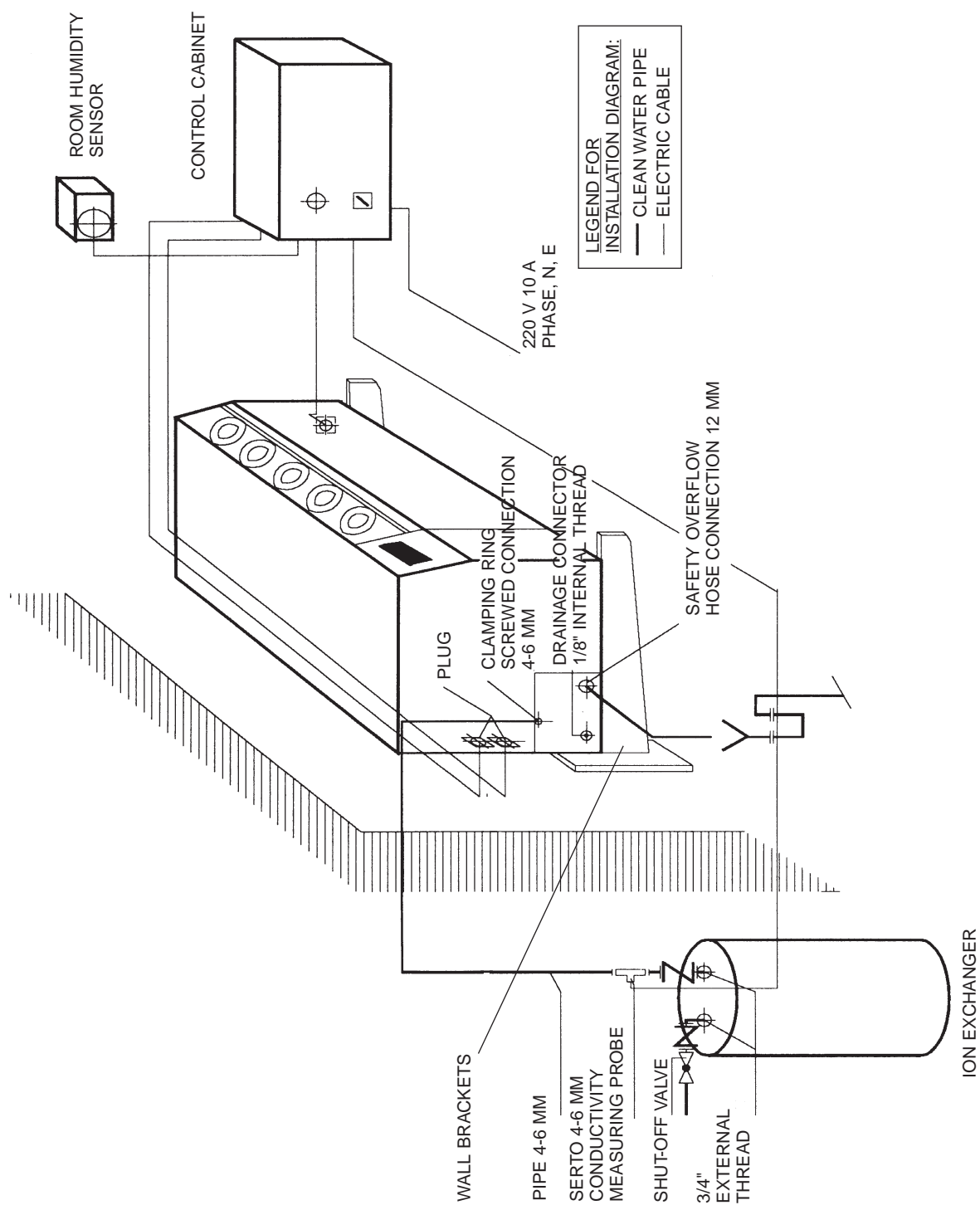
If the humidifier is installed on brackets, the safety overflow should be connected to the drain with a hose. If it is not possible to connect the safety overflow to the drain, the humidifier is to be installed in a tray in which a water sensor is mounted. If there is a malfunction and the humidifier overflows, a solenoid valve installed immediately upstream of the water entry into the humidifier is closed via the water sensor.

The minimum distance to persons who are in the area of the humidifier should be 5.0 m.

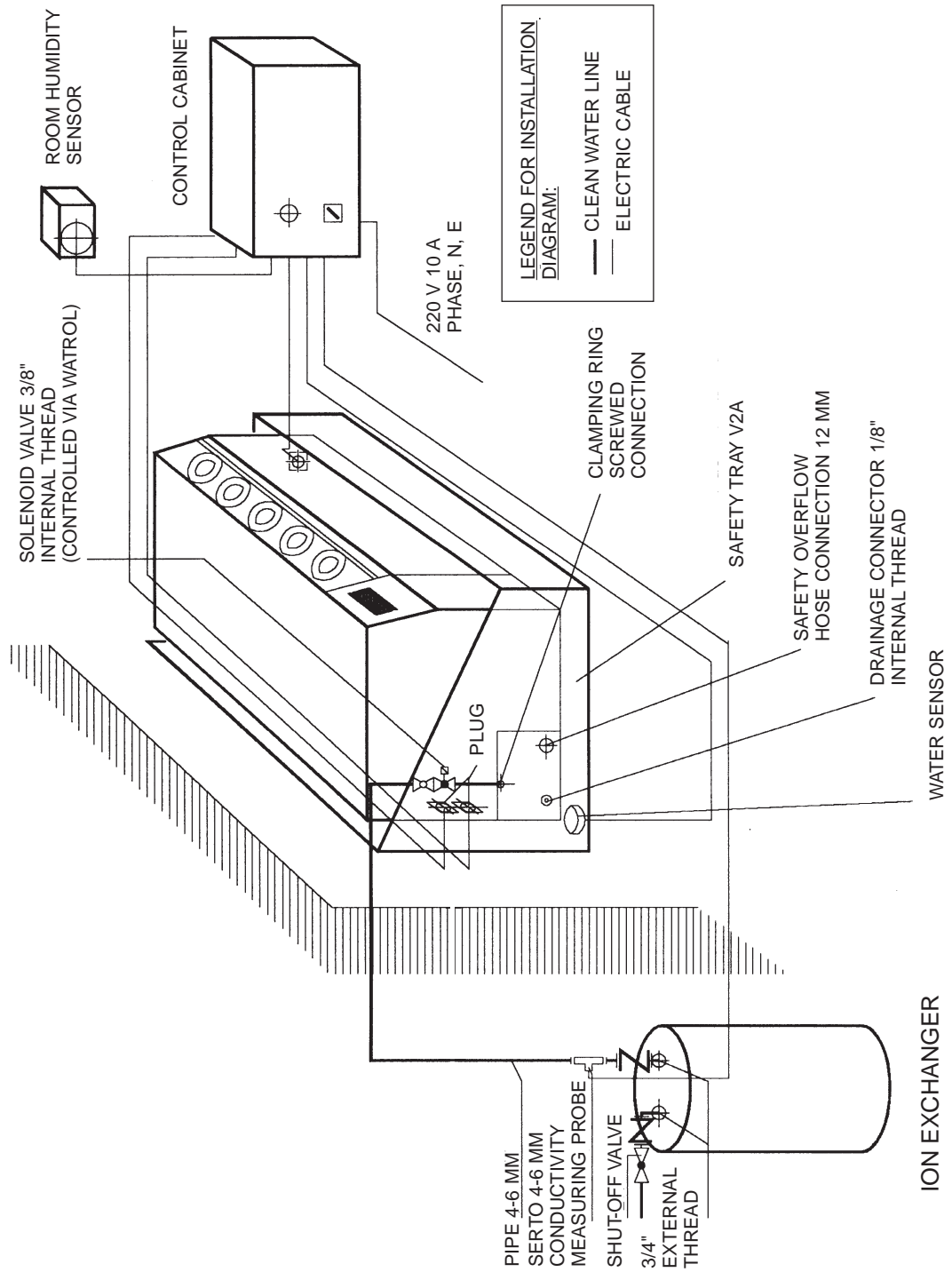


Humidifier installation with wall brackets

Drawing no. 17



Safety tray for water sensor Drawing no. 18



5.3 Commissioning

Preparation for commissioning

- a) The humidifying unit must be aligned exactly horizontally and in the direction of the corresponding air flow.
- b) All pipe connections must be made and connected correctly, securely and safely.
- c) The power supply is 220/48 V and is locked electrically with the fan.
- d) All other components must be assembled and installed correctly and reliably.
- e) The humidifier must be connected to both electrical and deionized water supplies.
- f) A pressure switch for monitoring the water supply pipe for too low pressure is locked to the humidifier.

Precautionary measures during a longer shut-down

- 1) The water must be drained off if the humidifying unit is not used for a long time.
- 2) The water supply shut-off valve must be closed.
- 3) The master switch on the control station must be switched off.

The following must be checked before the humidifying unit is put into operation again after a longer shut-down:

- a) The housing of the humidifying unit must be installed safely in the correct position and be in good operating condition.
- b) The power and water supplies to the humidifying unit must be connected.



Under no circumstances may the master switch be switched on whilst the humidifying unit is still on its side or is stored upside down.

The humidifying unit must never be operated for longer periods of time without an air supply.

Operating the system

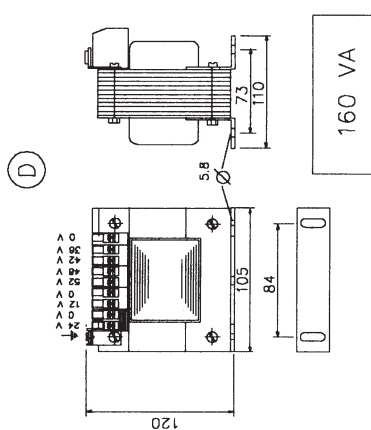
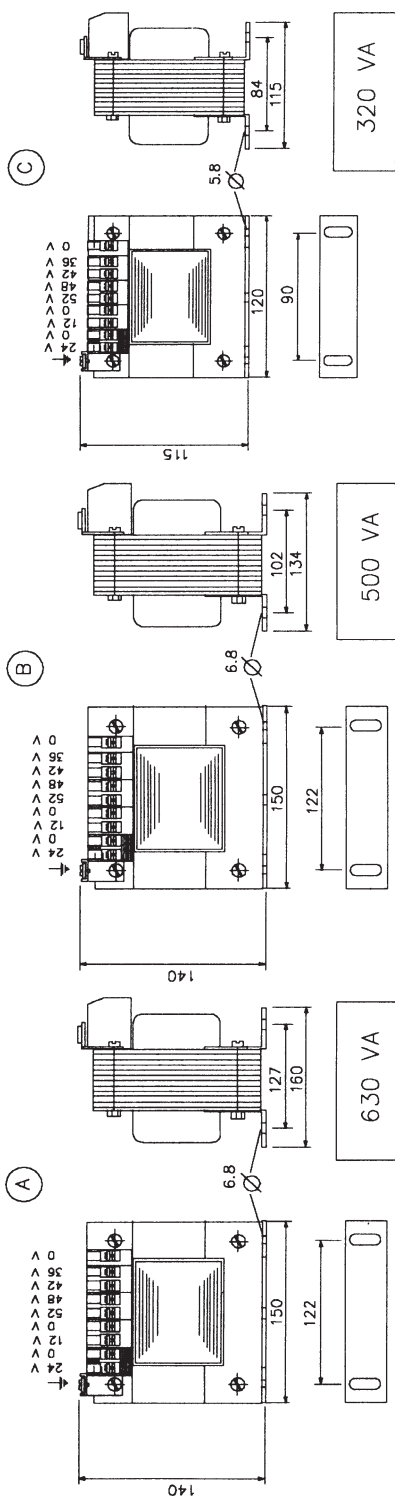
- 1) The water tap is opened.
- 2) The hygrostat, i.e. the humidity control, is set to the level of the air humidity required.
- 3) If humidifying is required, water is automatically poured in up to the required level and the atomization is started.
- 4) The mist then generated is blown by the air flow into the room air and the room is humidified.
- 5) The water level in the container is then kept at a constant level and the air humidity is kept at the set value.
- 6) If, during operation, the water level in the container falls below the safety level, the operation of the humidifier is switched off with the aid of the float switch.

5.4 Precautionary measures when operating the BNB model range

- 1) The humidifying unit is to be mounted so that the mist generated can be distributed fully and evenly in the entire room.
- 2) If the humidifier is attached at a higher point, it is to be ensured that it is easily accessible for adjustments, maintenance and inspections.
- 3) Direct air flow from an air conditioning system to the humidifier outlet is to be avoided.
- 4) Only demineralized water of $< 20 \mu\text{S}/\text{cm}$ may be introduced into the humidifier as supply water. A shut-off valve is to be provided in the supply line.
- 5) The safety overflow from the humidifier and the condensate from the drain is to be removed via a pipeline (high-quality steel pipe or plastic pipe).
- 6) The control station is to be installed as close as possible to the humidifying unit, i.e. where temperature and humidity can be kept at the normal level for good ventilation.
- 7) The hygrostat must be properly ventilated.
- 8) The humidifying unit must not be operated if the room temperature drops below 0°C . The water tank of the unit should be emptied.

6. Accessories

6.1 Data sheet for safety transformers



EUROPEAN MARKET

TRANSFORMER OUTPUT	MODEL BNB
160 VA	1000 (100)
320 VA	2000 (180)
500 VA	3000 (250)
	4000 (340)
	5000 (430)
2 x 500 VA	8000 (670)

AMERICAN MARKET

TRANSFORMER OUTPUT	MODEL BNB
160 VA	1000 (120)
320 VA	2000 (216)
500 VA	3000 (300)
	4000 (400)
630 VA	5000 (516)
2 x 500 VA	8000 (804)

6.2 Information on the conductivity measuring instrument

The conductivity measuring instrument measures and monitors the conductivity of the demineralized water in $\mu\text{S/cm}$.

For a measured value of $5 \mu\text{S/cm}$, the floating contact activates the pre-alarm. The contact is closed via terminals X1.9 and X1.10 and opened by X1.9 and X1.8.

For a measured value of $20 \mu\text{S/cm}$, the floating contact activates the alarm signal. The contact is closed via terminals X1.6 and X1.7 and opened via 1.6 and X1.5.

The terminals X1.1 and 1.2 are provided for connecting a pointer-type instrument. The output voltage is 0-1 V, which corresponds to a measuring range of 0-50 $\mu\text{S/cm}$. The conductivity cannot be checked with a multiple measuring instrument.

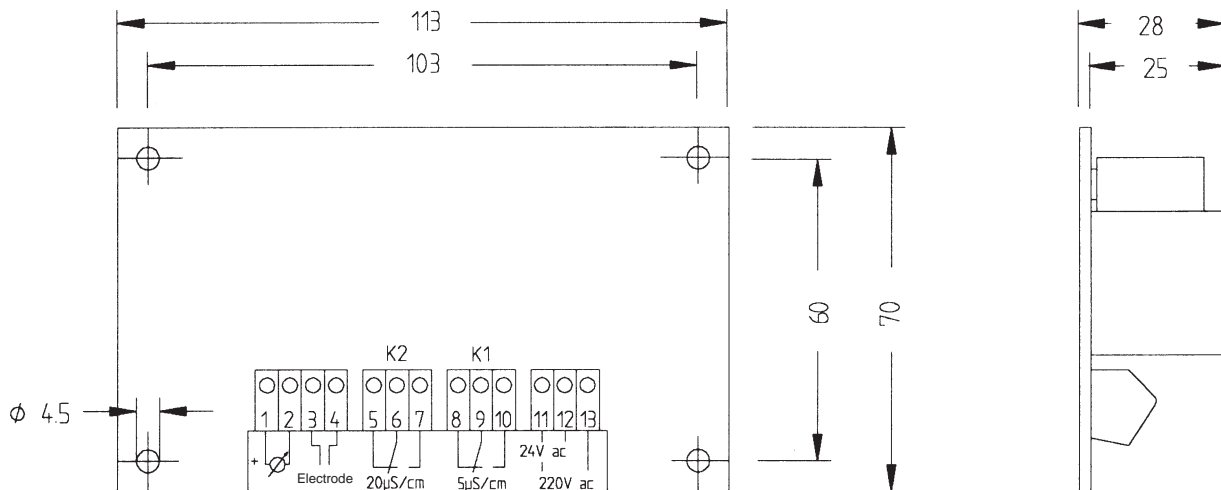
A potentiometer is provided for the final calibration of 0-1 V. Calibration can be made by connection of measuring shunts for checking the printed circuit board.

The individual, subsequent resistors, connected in place of the electrode, simulate:

500 kOhm	=	1 $\mu\text{S/cm}$
100 kOhm	=	5 $\mu\text{S/cm}$
50 kOhm	=	10 $\mu\text{S/cm}$
25 kOhm	=	20 $\mu\text{S/cm}$
10 kOhm	=	50 $\mu\text{S/cm}$

The electrode itself can only be checked by comparative measurement.

Conductivity measuring instrument



Terminal assignment

X1.1	0 - 1 V actual value output (0 - 50 $\mu\text{S/cm}$)	X1.8	K1 normally closed contact (5 $\mu\text{S/cm}$)
X1.2	Ground	X1.9	K1 Pedestal pole
X1.3	Electrode	X1.10	K1 normally open contact
X1.4	Electrode	X1.11	0 V supply (N)
X1.5	K2 normally closed contact (20 $\mu\text{S/cm}$)	X1.12	24 V supply, 50/60 Hz
X1.6	K2 Pedestal pole	X1.13	220 V supply, 50/60 Hz (L)
X1.7	K2 normally open contact		

Measuring probe

